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NEWTONIAN AERODYNAMIC CHARACTERISTICS OF RIGHT ELLIPTICAL RAKED-OFF CONES FOR CONE THICKNESS RATIOS OF 0.25 TO 3

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SUMMARY

A parametric study has been made of the Newtonian aerodynamic characteristics of right elliptical raked-off cones, in general, for cone thickness ratios of 0.25 to 3.0 and, in particular, to determine a range of configurations which might be used as heat shields for manned vehicles entering the earth's atmosphere at hyperbolic speeds.

Newtonian longitudinal aerodynamic force and moment coefficients for angles of attack of $\pm 15^{\circ}$ are presented. Also presented are the values of base thickness ratios and lateral surface areas which coincide with the configurations considered. It was found that, for low cone thickness ratios, the longitudinal stability limit is the limiting factor from the standpoint of a realistic center-of-gravity location. However, as the cone thickness ratio increases, the center-of-gravity limit becomes a function of the directional stability limit. The lateral stability limit is never the determining factor. The lift-to-drag ratio was found to increase with increasing cone thickness ratio and to be a function of the rake angle and the cone half-angle measured in the vertical plane. After restricting the cone to trim at zero angle of attack, to have a minimum lift-to-drag ratio of 0.6, and to have longitudinal, directional, and lateral stability, it was found that only three cone families met the restrictions. Newtonian longitudinal force and moment coefficients for the resulting three families, for the complete angle-of-attack range of 0° to 360°, are presented.

INTRODUCTION

Entry into the earth's atmosphere at hyperbolic velocities requires that manned spacecraft be capable of experiencing a severe heating environment. The spacecraft must also have some means of trajectory control, for example, aerodynamic lift, to prevent either skip-out or high deceleration loads. A heat shield shape which would minimize the total heat load during entry at hyperbolic speeds was shown in reference 1 to be a right circular cone at zero angle of attack. Such a configuration yields no aerodynamic lift.

In reference 2, a vehicle was designed to provide adequate heat protection as well as a lifting capability while trimming at zero angle of attack. This vehicle, which utilized a raked circular conical forebody with an elliptical conical afterbody, was found to possess undesirable directional stability characteristics. In reference 3 the concept of reference 2 was extended to raked-off elliptical conical forebodies having circular bases. In general, the raked-off elliptical cones studied exhibited better static stability characteristics than raked-off circular cones. Since the results of these restricted studies gave promise to utilizing this type of configuration for earth entry at hyperbolic speeds, it became evident that a more general study of raked-off elliptical cones was needed.

The purpose of the present study is to study parametrically the raked-off elliptical cone for a large range of cone thickness ratios and to impose the restrictions of the cone trimming at zero angle of attack, to having a minimum lift-to-drag ratio of 0.6, and to having positive longitudinal, lateral, and directional static stability about centers of gravity which are considered to be reasonable.

Newtonian longitudinal aerodynamic force and moment coefficients for an angle-of-attack range of $\pm 15^{\circ}$ and stability derivatives are presented for 20 elliptical cones for which the cone thickness ratio was varied from 0.25 to 3.0. The cone half-angle in the vertical plane varied from 20° to 60° and the rake angle varied from 30° to 80°. Additional parameters include base thickness ratios and lateral surface areas which coincide with the configurations investigated. Aerodynamic force and moment coefficients for the families of configurations which met the imposed restrictions are presented throughout the complete angle-of-attack range of 0° to 360°. Calculations presented in this paper consider only the aerodynamics for vehicle forebodies, and no considerations are made for afterbodies that would have to exist for realistic reentry configurations.

SYMBOLS

a	base semi-height of the elliptical-cone configuration
b	base semi-width of the elliptical-cone configuration
C_A	axial-force coefficient, $\dfrac{-F_X}{qS}$
C_D	drag coefficient, $\dfrac{F_D}{qS}$
C_L	lift coefficient, $\dfrac{F_L}{qS}$
C_l	rolling-moment coefficient, $\dfrac{M_X}{qS\bar{d}}$

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C_m pitching-moment coefficient, $\dfrac{M_Y}{qSd}$

C_{m_α} $\dfrac{\Delta C_m}{\Delta \alpha}\bigg|_{\alpha=0°}$, per deg

C_N normal-force coefficient, $\dfrac{-F_Z}{qS}$

C_n yawing-moment coefficient, $\dfrac{M_Z}{qSd}$

C_p pressure coefficient, $\dfrac{p - p_\infty}{q}$

C_Y side-force coefficient, $\dfrac{F_Y}{qS}$

C_{l_β} $\dfrac{\Delta C_l}{\Delta \beta}\bigg|_{\beta=0°}$, per deg

C_{n_β} $\dfrac{\Delta C_n}{\Delta \beta}\bigg|_{\beta=0°}$, per deg

C_{Y_β} $\dfrac{\Delta C_Y}{\Delta \beta}\bigg|_{\beta=0°}$, per deg

d cone base height = reference length

e base thickness ratio, $\dfrac{a}{b}$

F_D drag force

F_L lift force

F_X force along X-axis

F_Y force along Y-axis

F_Z force along Z-axis

L/D lift-drag ratio, C_L/C_D

m cone thickness ratio, $\dfrac{\tan \theta_{XZ}}{\tan \theta_{XY}}$

M_X	rolling moment
M_Y	pitching moment
M_Z	yawing moment
p	local pressure
p_∞	free-stream pressure
q	free-stream dynamic pressure
S	reference area
S'	lateral surface area of cone
X, Y, Z	Cartesian body coordinate axes
x, y, z	distance along X-, Y-, and Z-axis, respectively
α	angle of attack, deg
β	angle of sideslip, deg
δ	rake-off angle, deg
θ_{XY}	cone half-angle measured in horizontal plane, deg
θ_{XZ}	cone half-angle measured in vertical plane, deg
ϕ	cylindrical polar coordinate angle measured about the X-axis

CONFIGURATIONS

An example of the elliptical configurations investigated is shown in figure 1 along with the reference axes system. The cone half-angles θ_{XZ} measured in the vertical plane varied from $20°$ to $60°$ in $10°$ increments. The cone half-angles θ_{XY} measured in the horizontal plane were varied to obtain cone thickness ratios of 0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, and 3. The rake angle δ varied from $\left(\theta_{XZ} + 10°\right)$ to $80°$ for all configurations. Combinations of these variables resulted in 160 configurations.

Since an afterbody must be added to form a complete vehicle, the thickness ratio of the interface, which is always an ellipse, must be known. Table I presents the base thickness ratio, which is used to determine base area, as a function of cone thickness ratio and rake angle.

Inasmuch as a major design variable for vehicles entering at hyperbolic speeds is the heat-shield surface area, lateral surface area as a function of cone thickness ratio and rake angle is presented in table II. The derivation of the equations used for this presentation is included in the appendix.

METHOD OF COMPUTATION

The aerodynamic coefficients were obtained by integrating the Newtonian force and moment equations with a numerical double integration routine on a digital computer. The integral relations and the integration method as presented in reference 3 were derived from the approach described in reference 4. The basic equations are:

$$C_N = \frac{1}{S} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x \tan \theta_{XZ} \cos \phi}{\left(m^2 \sin^2 \phi + \cos^2 \phi\right)^{3/2}} \, d\phi dx$$

$$C_A = -\frac{1}{S} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x \tan^2 \theta_{XZ}}{m^2 \sin^2 \phi + \cos^2 \phi} \, d\phi dx$$

$$C_m = \frac{\sec^2 \theta_{XZ}}{Sd} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x^2 \tan \theta_{XZ} \cos \phi}{\left(m^2 \sin^2 \phi + \cos^2 \phi\right)^{3/2}} \, d\phi dx$$

$$C_Y = -\frac{1}{S} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x m^2 \tan \theta_{XZ} \sin \phi}{\left(m^2 \sin^2 \phi + \cos^2 \phi\right)^{3/2}} \, d\phi dx$$

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$$C_n = -\frac{m^2 + \tan^2\theta_{XZ}}{Sd} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x^2 \tan\theta_{XZ} \sin\phi}{\left(m^2\sin^2\phi + \cos^2\phi\right)^{3/2}} \, d\phi dx$$

$$C_l = \frac{m^2 - 1}{Sd} \int_{-d}^{0} \int_{\phi_L}^{\phi_U} \frac{C_p x^2 \tan^2\theta_{XZ} \cos\phi \sin\phi}{\left(m^2\sin^2\phi + \cos^2\phi\right)^{2}} \, d\phi dx$$

where

$$C_p = \frac{2}{m^2 s^2 \sin^2\phi + \cos^2\phi} \left(\lambda \sin\theta_{XZ} \sqrt{m^2\sin^2\phi + \cos^2\phi} \right.$$

$$\left. + ms\upsilon \cos\theta_{XY} \sin\phi - \omega \cos\theta_{XZ} \cos\phi \right)^2$$

$$s = \frac{\sin\theta_{XZ}}{\sin\theta_{XY}}$$

$$\lambda = \cos\alpha \cos\beta$$

$$\omega = \sin\alpha \cos\beta$$

$$\upsilon = -\sin\beta$$

and

ϕ_U and ϕ_L are the upper and lower integration limits determined by either the flow-see boundary or the configuration geometry. These integration limits are explained in detail in appendix B of reference 3.

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It should be noted that the double integration routine which was used has been checked for elliptical integrals and compared with the closed form results presented in reference 4. In all cases, the agreement appears very good, the difference being less than 1 percent.

The reference area S is defined as the base area of the cone which is πab where

$$b = d \; \frac{\tan \theta_{XY}}{\tan \theta_{XZ}} \left[\left(\frac{-\sin \delta \cot \theta_{XZ}}{2} \right)^2 \tan^2 \theta_{XZ} \right.$$

$$\left. - \left\{ -\tan \delta \left[\frac{1}{2} \frac{\sin (\delta - \theta_{XZ})}{\sin \theta_{XZ}} - \left(\frac{\sin \delta \cot \theta_{XZ}}{2} \right) \right] - \frac{1}{2} \frac{\sin(\delta - \theta_{XZ})}{\cos \theta_{XZ}} \right\}^2 \right]^{\frac{1}{2}}$$

All coefficients correspond to a maximum stagnation point pressure coefficient C_p of 2.0. The aerodynamics of the cone base is not included since afterbody aerodynamics has to be added for a complete reentry vehicle. The directional and lateral stability derivatives were determined by computing the coefficients at an angle of sideslip of $5°$ and assuming linearity. The longitudinal stability derivative was computed from an angle of attack of $1°$, again assuming linearity.

RESULTS AND DISCUSSION

The Newtonian longitudinal force and moment coefficients for all configurations are presented in tables III to VII. It should be noted that the coefficients presented for a cone thickness ratio m of 1.0 (circular cones) differ by about 1 percent from those presented in reference 3. This was found to result from differences in integration routines. The directional and lateral stability derivatives are presented (for the reference center shown in fig. 1) in table VIII.

The lift-to-drag ratios at an angle of attack of $0°$ are summarized in figure 2 as a function of cone thickness ratio. As can be seen, for a constant δ, L/D increases as m increases; however, for a constant m, L/D decreases as δ increases. For a constant δ and constant m greater than 1, L/D increases with a decrease in θ_{XZ}; whereas, for an m less than 1, L/D decreases with a decrease in θ_{XZ}. As was shown in reference 3, for circular cones (m of 1.0) the L/D at $0°$ angle of attack is independent of θ_{XZ} and becomes a function of δ only. It is interesting to note that for an m of 1.0, the L/D is the flat plate value, which is the cotangent of δ. Thus,

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for $m > 1.0$, the cone L/D is greater than the flat plat value, and for $m < 1.0$, the converse is true.

Figure 3 presents a typical configuration and the locus of all center-of-gravity locations at which the configuration would trim at zero angle of attack. Since no center-of-gravity offset in the Y-direction was considered, the equation of this line to trim at an angle of attack of zero may be written:

$$\frac{x}{d} = \frac{C_m}{C_N} + \frac{C_A}{C_N}\frac{z}{d}$$

The longitudinal stability limit was then determined as the center-of-gravity location on the line to trim at which C_{m_α} went to zero. The center-of-pressure locations for the lateral and directional aerodynamics can be determined by $\frac{z}{d} = -\frac{C_l}{C_Y}$ and $\frac{x}{d} = \frac{C_n}{C_Y}$. Thus, all stability limits can be expressed as a function of $\frac{x}{d}$ location along the line to trim. Figures 4 to 8 present the stability limits for all configurations as a function of m. It is seen that for low m values, the longitudinal stability limit is the limiting factor. However, as m increases, the center-of-gravity limit is determined by the directional stability limit. It should be noted that in all cases, this occurs at or before m equals 1.0. The lateral stability limit is never the determining factor.

The first restriction was that, for a configuration to be acceptable, it must have an L/D of at least 0.6 while trimmed at zero angle of attack. The choice of this limit is based on results presented in reference 2 for earth entry missions at hyperbolic speeds. The second restriction was that the vehicle must have positive longitudinal, directional, and lateral static stability. Also presented in figures 4 to 8 are the most forward center-of-gravity limits for all configurations as a function of m. The location of the most forward acceptable center of gravity was chosen as the intersection of the line to trim with the cone base (see fig. 3). This arbitrary limit is determined from both geometric and aerodynamic considerations and seems a logical choice for a parametric study.

Of the configurations studied, only four families of constant θ_{XZ} and δ satisfy the previously defined aerodynamic restrictions. These are $\theta_{XZ} = 30°$, $\delta = 40°$, where $0.25 \leq m \leq 0.65$; $\theta_{XZ} = 30°$, $\delta = 50°$, where $0.25 \leq m \leq 0.75$; and $\theta_{XZ} = 40°$, $\delta = 50°$, where $0.25 \leq m \leq 1.00$. Although the family $\theta_{XZ} = 50°$, $\delta = 60°$, with $1.25 \leq m \leq 1.375$, satisfies the restrictions, it has been eliminated from future consideration because of its limited range of m and because L/D was only slightly above 0.6. The longitudinal aerodynamics of the three remaining configurations is presented in tables IX to XI for the entire angle-of-attack range of 0° to 360°.

Although these configurations met the imposed aerodynamic requirements, the physical characteristics of cone lateral surface area and base thickness ratio should be analyzed. Figure 9 presents lateral surface area as a function of m and δ, and figure 10 presents the base thickness ratio of the final configurations. As can be seen in figure 9, the lateral surface area decreases with increasing m. This indicates that of the selected configurations, the ones with the highest value of m would result in a heat shield which would present the least surface area to be heat protected. From figure 10, it can be seen that a base thickness ratio of 1.0 falls within the acceptable range of the final configurations.

CONCLUSIONS

As a result of a parametric study of the Newtonian aerodynamics of right elliptical raked-off cones, the following conclusions were made:

1. Of the configurations studied three cone families of limited cone thickness ratios were selected on the basis of stability and lift-to-drag ratio from a wide range of cone thickness ratio, cone half-angle in the vertical plane, and rake angle.

2. For low cone thickness ratio values, the longitudinal stability limit is the limiting factor (from the standpoint of realistic center-of-gravity location). However, as the cone thickness ratio value increases, the center of gravity is dictated by the directional stability limit at or before the cone thickness ratio equals 1.0 for all cases. The lateral stability limit is never the determining factor.

3. The lift-to-drag ratio characteristics of all configurations may be summarized as follows:

(a) For constant cone half-angles in the vertical plane and constant rake angles, the lift-to-drag ratio increases with an increase in cone thickness ratio.

(b) For constant cone thickness ratios, the lift-to-drag ratio decreases with an increase in rake angle.

(c) For constant rake angle and constant cone thickness ratios greater than 1.0, lift-to-drag increases with a decrease in cone half-angle in the vertical plane.

(d) For constant rake angles and constant cone thickness ratios less than 1.0, lift-to-drag ratios decrease with a decrease in cone half-angle in the vertical plane.

4. The facts that lateral surface area decreased with an increase in cone thickness ratio, lift-to-drag ratios increased with an increase in cone thickness ratio, and stability became more restrictive with an increase in cone thickness ratio suggest the possibility of further optimization dependent on particular mission requirements.

APPENDIX

The purpose of this appendix is to derive the relations used to calculate the surface area of the configurations presented in this paper. The equation for the surface of a conic right body whose cross section is an ellipse may be expressed as follows:

$$F(x,y,z) = \frac{y^2}{h^2} + \frac{z^2}{g^2} - x^2 = 0 \tag{A1}$$

where

$$g = \tan \theta_{XZ}$$

and

$$h = \tan \theta_{XY}$$

Taking an incremental $\Delta S'$ (surface area), the surface area may be expressed as follows:

$$S' = \iint \sec \gamma \, dA \tag{A2}$$

where γ is defined as the acute angle which the normal to the tangent plane makes with the Y-axis (see sketch a) and dA is the incremental area dxdz.

If the surface is represented by an equation $F(x,y,z) = 0$, where F has continuous derivatives and $\frac{\partial F}{\partial x} \neq 0$, sec γ may be defined as follows:

$$\sec \gamma = \frac{\left[\left(\frac{\partial F}{\partial x}\right)^2 + \left(\frac{\partial F}{\partial y}\right)^2 + \left(\frac{\partial F}{\partial z}\right)^2\right]^{1/2}}{\left|\frac{\partial F}{\partial y}\right|} \tag{A3}$$
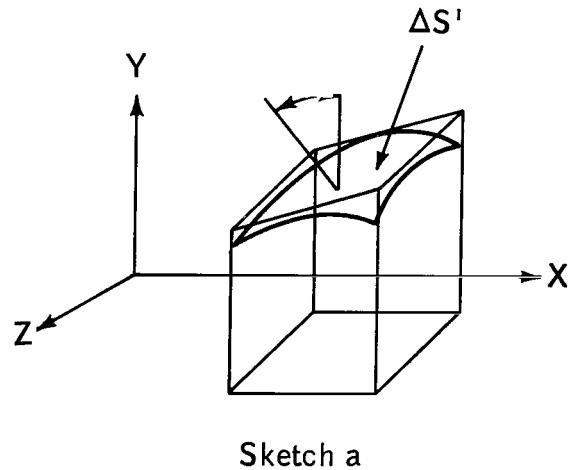
Sketch a

or the surface area may be defined as

$$S' = \iint \sqrt{\frac{\left(g^4 h^2 + g^4\right)x^2 + \left(h^2 - g^2\right)z^2}{g^4 x^2 - g^2 z^2}} \, dxdz \tag{A4}$$

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Considering the configurations presented, equation (A4) has been nondimensionalized and the integration limits were determined from sketch b. The equation for the lateral surface area of raked-off elliptical cones now becomes

$$\frac{S'}{d^2} = 2 \int_{z_1}^{z_2} \int_{-x_2}^{x_1} \sqrt{\frac{\left(g^4 h^2 + g^4\right)\left(\frac{x}{d}\right)^2 + \left(h^2 - g^2\right)\left(\frac{z}{d}\right)^2}{g^4\left(\frac{x}{d}\right)^2 - g^2\left(\frac{z}{d}\right)^2}} \, d\left(\frac{x}{d}\right) d\left(\frac{z}{d}\right)$$

$$+ 2 \int_{z_3}^{z_1} \int_{x_2}^{x_1} \sqrt{\frac{\left(g^4 h^2 + g^4\right)\left(\frac{x}{d}\right)^2 + \left(h^2 - g^2\right)\left(\frac{z}{d}\right)^2}{g^4\left(\frac{x}{d}\right)^2 - g^2\left(\frac{z}{d}\right)^2}} \, d\left(\frac{x}{d}\right) d\left(\frac{z}{d}\right)$$

(A5)

where

$$z_1 = 0$$

$$z_2 = -\frac{1}{2} \frac{\sin\left[180° - \left(\delta + \theta_{XZ}\right)\right] \tan\theta_{XZ}}{\sin\theta_{XZ}}$$

$$z_3 = \frac{1}{2} \frac{\sin\left(\delta - \theta_{XZ}\right)}{\cos\theta_{XZ}}$$

$$x_1 = \frac{\frac{z}{d}}{\tan\theta_{XZ}}$$

$$x_2 = \frac{-\frac{z}{d}}{\tan\delta} + \frac{1}{2}\frac{\sin\left(\delta - \theta_{XZ}\right)}{\cos\theta_{XZ}\tan\delta} + \frac{1}{2}\frac{\sin\left(\delta - \theta_{XZ}\right)}{\sin\theta_{XZ}}$$

Sketch b

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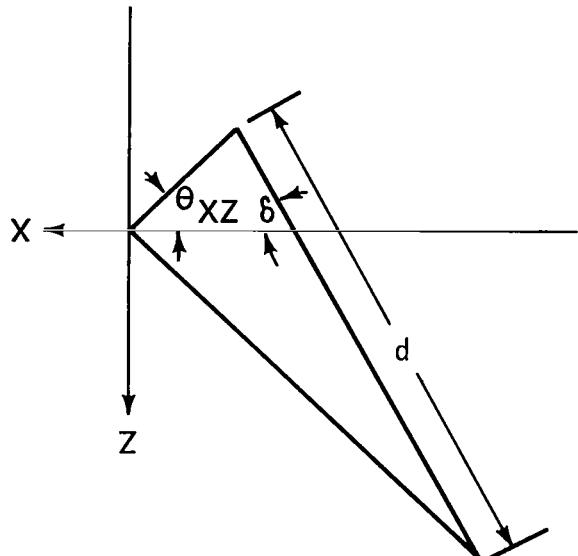
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TABLE I.- BASE THICKNESS RATIOS

(a) $\theta_{XZ} = 20°$.

m \ δ, deg	30	40	50	60	70	80
0.25	0.6440	0.4316	0.3427	0.2952	0.2684	0.2543
.50	1.2883	.8632	.6854	.5905	.5368	.5087
.75	1.9319	1.2950	1.0281	.8857	.8052	.7631
1.0	2.5759	1.7265	1.3709	1.1811	1.0736	1.0175
1.5	3.8639	2.5906	2.0567	1.7717	1.6108	1.5262
2.0	5.1546	3.4530	2.7412	2.3618	2.1468	2.0350
2.5	6.4432	4.3177	3.4270	2.9533	2.6838	2.5445
3.0	7.7279	5.1813	4.1118	3.5435	3.2216	3.0525

(b) $\theta_{XZ} = 30°$.

m \ δ, deg	40	50	60	70	80
0.25	0.5359	0.3730	0.3061	0.2721	0.2551
.50	1.0720	.7460	.6123	.5442	.5103
.75	1.6077	1.1190	.9186	.8163	.7655
1.0	2.1440	1.4920	1.2248	1.0883	1.0208
1.5	3.2154	2.2391	1.8368	1.6329	1.5309
2.0	4.2881	2.9850	2.4497	2.1767	2.0416
2.5	5.3590	3.7313	3.0618	2.7218	2.5523
3.0	6.4350	4.4762	3.6737	3.2658	3.0618

TABLE I.- Concluded

(c) $\theta_{XZ} = 40°.$

δ, deg / m	50	60	70	80
0.25	0.4596	0.3299	0.2793	0.2566
.50	.9191	.6599	.5587	.5133
.75	1.3785	.9899	.8382	.7700
1.0	1.8382	1.3199	1.1175	1.0266
1.5	2.7578	1.9801	1.6761	1.5403
2.0	3.6764	2.6399	2.2351	2.0533
2.5	4.5955	3.3003	2.7932	2.5667
3.0	5.5126	3.9588	3.3534	3.0807

(d) $\theta_{XZ} = 50°.$

δ, deg / m	60	70	80
0.25	0.3979	0.2952	0.2596
.50	.7956	.5905	.5193
.75	1.1933	.8857	.7789
1.0	1.5913	1.1811	1.0386
1.5	2.3877	1.7717	1.5581
2.0	3.1826	2.3618	2.0267
2.5	3.9777	2.9533	2.7917
3.0	4.7755	3.5435	3.1152

(e) $\theta_{XZ} = 60°.$

δ, deg / m	70	80
0.25	0.3427	0.2665
.50	.6854	.5331
.75	1.0281	.7997
1.0	1.3709	1.0663
1.5	2.0559	1.5994
2.0	2.7427	2.1331
2.5	3.4270	2.6652
3.0	4.1118	3.1989

TABLE II.– NONDIMENSIONAL LATERAL SURFACE AREA OF

RAKED-OFF ELLIPTICAL CONES

(a) $\theta_{XZ} = 20°$.

m \ δ, deg	30	40	50	60	70	80
0.25	1.4772	2.6653	3.8916	5.0342	5.9627	6.5679
.50	.7759	1.4269	2.1021	2.7321	3.2443	3.5783
.75	.5524	1.0380	1.5441	2.0171	2.4018	2.6527
1.0	.4456	.8548	1.2829	1.6835	2.0095	2.2221
1.5	.3454	.6853	1.0430	1.3782	1.6511	1.8292
2.0	.2994	.6089	.9357	1.2422	1.4918	1.6547
2.5	.2739	.5670	.8772	1.1682	1.4053	1.5601
3.0	.2580	.5412	.8413	1.1230	1.3526	1.5024

(b) $\theta_{XZ} = 30°$.

m \ δ, deg	40	50	60	70	80
0.25	1.6501	2.6781	3.5909	4.3214	4.7946
.50	.8519	1.4032	1.8961	2.2914	2.5478
.75	.5947	.9983	1.3619	1.6543	1.8441
1.0	.4710	.8063	1.1105	1.3558	1.5152
1.5	.3539	.6279	.8790	1.0823	1.2147
2.0	.2996	.5469	.7753	.9605	1.0811
2.5	.2693	.5025	.7187	.8944	1.0088
3.0	.2504	.4751	.6841	.8540	.9648

TABLE II.- Concluded

(c) $\theta_{XZ} = 40°$.

δ, deg m	50	60	70	80
0.25	1.8537	2.8005	3.5136	3.9662
.50	.9470	1.4455	1.8235	2.0640
.75	.6522	1.0100	1.2837	1.4585
1.0	.5092	.8016	1.0272	1.1718
1.5	.3728	.6063	.7892	.9070
2.0	.3091	.5172	.6820	.7885
2.5	.2734	.4681	.6234	.7241
3.0	.2509	.4378	.5876	.6848

(d) $\theta_{XZ} = 50°$.

δ, deg m	60	70	80
0.25	2.0910	2.9705	3.4926
.50	1.0605	1.5165	1.7888
.75	.7230	1.0441	1.2374
1.0	.5580	.8156	.9720
1.5	.3993	.5991	.7224
2.0	.3245	.4993	.6086
2.5	.2822	.4439	.5461
3.0	.2555	.4097	.5076

(e) $\theta_{XZ} = 60°$.

δ, deg m	70	80
0.25	2.3836	3.1587
.50	1.2025	1.5992
.75	.8132	1.0876
1.0	.6216	.8374
1.5	.4354	.5967
2.0	.3465	.4838
2.5	.2958	.4205
3.0	.2636	.3809

(a) $\delta = 30°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0122	-0.0116	-0.0106	-0.0095	-0.0076	-0.0063	-0.0054	-0.0046
-10.0000	-0.0543	-0.0512	-0.0474	-0.0436	-0.0371	-0.0322	-0.0285	-0.0255
-5.0000	-0.1152	-0.1089	-0.1015	-0.0941	-0.0815	-0.0717	-0.0639	-0.0576
-4.0000	-0.1295	-0.1225	-0.1142	-0.1061	-0.0921	-0.0811	-0.0723	-0.0653
-3.0000	-0.1444	-0.1367	-0.1276	-0.1187	-0.1032	-0.0909	-0.0812	-0.0734
-2.0000	-0.1600	-0.1516	-0.1416	-0.1318	-0.1148	-0.1013	-0.0906	-0.0818
-1.0000	-0.1762	-0.1670	-0.1562	-0.1455	-0.1269	-0.1121	-0.1003	-0.0907
0.	-0.1930	-0.1831	-0.1713	-0.1597	-0.1394	-0.1233	-0.1104	-0.0999
1.0000	-0.2104	-0.1997	-0.1870	-0.1744	-0.1525	-0.1350	-0.1210	-0.1095
2.0000	-0.2284	-0.2168	-0.2032	-0.1897	-0.1660	-0.1471	-0.1319	-0.1195
3.0000	-0.2469	-0.2345	-0.2199	-0.2054	-0.1800	-0.1596	-0.1432	-0.1297
4.0000	-0.2659	-0.2527	-0.2371	-0.2216	-0.1944	-0.1725	-0.1548	-0.1403
5.0000	-0.2855	-0.2714	-0.2547	-0.2382	-0.2091	-0.1857	-0.1668	-0.1513
10.0000	-0.3897	-0.3712	-0.3492	-0.3273	-0.2885	-0.2569	-0.2312	-0.2100
15.0000	-0.5025	-0.4794	-0.4519	-0.4244	-0.3751	-0.3347	-0.3017	-0.2743

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0219	-0.0189	-0.3168	-0.0154	-0.0133	-0.0117	-0.0105	-0.0094
-10.0000	0.0481	0.0454	0.0416	0.0378	0.0315	0.0269	0.0234	0.0207
-5.0000	0.1428	0.1334	0.1225	0.1122	0.0950	0.0821	0.0723	0.0645
-4.0000	0.1645	0.1536	0.1411	0.1294	0.1098	0.0951	0.0837	0.0748
-3.0000	0.1870	0.1746	0.1606	0.1473	0.1252	0.1086	0.0957	0.0856
-2.0000	0.2104	0.1964	0.1807	0.1659	0.1413	0.1226	0.1082	0.0968
-1.0000	0.2345	0.2190	0.2017	0.1853	0.1580	0.1373	0.1213	0.1085
0.	0.2594	0.2423	0.2233	0.2053	0.1753	0.1524	0.1347	0.1207
1.0000	0.2851	0.2664	0.2456	0.2259	0.1932	0.1681	0.1487	0.1333
2.0000	0.3114	0.2911	0.2685	0.2472	0.2116	0.1843	0.1631	0.1462
3.0000	0.3384	0.3165	0.2921	0.2691	0.2305	0.2010	0.1780	0.1596
4.0000	0.3661	0.3424	0.3162	0.2915	0.2500	0.2181	0.1932	0.1734
5.0000	0.3943	0.3690	0.3409	0.3144	0.2699	0.2356	0.2089	0.1875
10.0000	0.5435	0.5095	0.4719	0.4363	0.3759	0.3291	0.2924	0.2629
15.0000	0.7023	0.6596	0.6122	0.5671	0.4902	0.4302	0.3828	0.3446

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1229	0.0833	0.0596	0.0456	0.0307	0.0230	0.0183	0.0153
-10.0000	0.1453	0.1029	0.0768	0.0609	0.0431	0.0335	0.0275	0.0233
-5.0000	0.1776	0.1322	0.1033	0.0850	0.0633	0.0509	0.0427	0.0369
-4.0000	0.1851	0.1392	0.1097	0.0908	0.0683	0.0552	0.0465	0.0403
-3.0000	0.1930	0.1465	0.1163	0.0969	0.0735	0.0597	0.0504	0.0438
-2.0000	0.2013	0.1541	0.1234	0.1033	0.0789	0.0644	0.0546	0.0475
-1.0000	0.2099	0.1621	0.1307	0.1101	0.0847	0.0694	0.0590	0.0515
0.	0.2188	0.1704	0.1383	0.1171	0.0906	0.0746	0.0636	0.0556
1.0000	0.2280	0.1790	0.1463	0.1244	0.0969	0.0800	0.0684	0.0599
2.0000	0.2375	0.1879	0.1545	0.1320	0.1034	0.0857	0.0734	0.0644
3.0000	0.2473	0.1971	0.1630	0.1398	0.1101	0.0915	0.0786	0.0690
4.0000	0.2573	0.2066	0.1718	0.1479	0.1171	0.0976	0.0840	0.0739
5.0000	0.2677	0.2164	0.1808	0.1563	0.1242	0.1038	0.0895	0.0788
10.0000	0.3227	0.2686	0.2295	0.2013	0.1631	0.1378	0.1197	0.1059
15.0000	0.3823	0.3256	0.2828	0.2509	0.2060	0.1754	0.1531	0.1359

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0857	0.0387	-0.0130	-0.0640	-0.1481	-0.2119	-0.2651	-0.2975
-10.0000	0.5388	0.6696	0.7938	0.8950	1.0414	1.1408	1.2086	1.2625
-5.0000	0.9590	1.2027	1.4208	1.5913	1.8283	1.9798	2.0904	2.1668
-4.0000	1.0222	1.2715	1.4902	1.6605	1.8900	2.0383	2.1392	2.2133
-3.0000	1.0760	1.3271	1.5451	1.7087	1.9279	2.0687	2.1668	2.2357
-2.0000	1.1210	1.3704	1.5801	1.7384	1.9476	2.0767	2.1665	2.2316
-1.0000	1.1572	1.4015	1.6039	1.7519	1.9462	2.0672	2.1506	2.2054
0.	1.1856	1.4219	1.6146	1.7532	1.9349	2.0429	2.1179	2.1709
1.0000	1.2066	1.4336	1.6140	1.7432	1.9099	2.0101	2.0777	2.1254
2.0000	1.2204	1.4366	1.6055	1.7250	1.8773	1.9678	2.0297	2.0711
3.0000	1.2279	1.4328	1.5903	1.7009	1.8393	1.9229	1.9775	2.0162
4.0000	1.2305	1.4225	1.5687	1.6707	1.7968	1.8722	1.9211	1.9556
5.0000	1.2273	1.4077	1.5434	1.6361	1.7524	1.8207	1.8656	1.8970
10.0000	1.1626	1.2893	1.3797	1.4405	1.5134	1.5565	1.5841	1.6041
15.0000	1.0515	1.1394	1.2005	1.2408	1.2895	1.3183	1.3368	1.3503

TABLE III.- CONTINUED

(b) $\delta = 40°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0322	0.0263	0.0222	0.0195	0.0161	0.0138	0.0121	0.0108
-10.0000	-0.0358	-0.0351	-0.0327	-0.0298	-0.0247	-0.0210	-0.0181	-0.0159
-5.0000	-0.1259	-0.1174	-0.1072	-0.0975	-0.0817	-0.0701	-0.0613	-0.0544
-4.0000	-0.1463	-0.1362	-0.1243	-0.1131	-0.0949	-0.0815	-0.0714	-0.0634
-3.0000	-0.1675	-0.1557	-0.1421	-0.1293	-0.1087	-0.0935	-0.0819	-0.0728
-2.0000	-0.1894	-0.1759	-0.1605	-0.1462	-0.1230	-0.1059	-0.0928	-0.0826
-1.0000	-0.2120	-0.1967	-0.1795	-0.1636	-0.1379	-0.1188	-0.1042	-0.0928
0.	-0.2353	-0.2182	-0.1992	-0.1816	-0.1532	-0.1322	-0.1160	-0.1033
1.0000	-0.2592	-0.2404	-0.2194	-0.2002	-0.1691	-0.1459	-0.1282	-0.1143
2.0000	-0.2837	-0.2630	-0.2402	-0.2192	-0.1854	-0.1602	-0.1408	-0.1255
3.0000	-0.3088	-0.2863	-0.2615	-0.2388	-0.2022	-0.1748	-0.1538	-0.1371
4.0000	-0.3344	-0.3101	-0.2834	-0.2589	-0.2194	-0.1898	-0.1671	-0.1491
5.0000	-0.3606	-0.3344	-0.3057	-0.2795	-0.2370	-0.2052	-0.1807	-0.1613
10.0000	-0.4981	-0.4624	-0.4236	-0.3882	-0.3305	-0.2870	-0.2533	-0.2265
15.0000	-0.6436	-0.5983	-0.5493	-0.5044	-0.4309	-0.3752	-0.3317	-0.2970

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1266	-0.1093	-0.0948	-0.0837	-0.0681	-0.0575	-0.0498	-0.0440
-10.0000	-0.0273	-0.0206	-0.0163	-0.0138	-0.0110	-0.0094	-0.0082	-0.0073
-5.0000	0.0958	0.0906	0.0831	0.0755	0.0629	0.0536	0.0466	0.0412
-4.0000	0.1230	0.1152	0.1052	0.0955	0.0796	0.0678	0.0590	0.0522
-3.0000	0.1509	0.1406	0.1280	0.1161	0.0967	0.0825	0.0719	0.0636
-2.0000	0.1796	0.1667	0.1515	0.1374	0.1145	0.0977	0.0852	0.0754
-1.0000	0.2090	0.1934	0.1757	0.1592	0.1327	0.1134	0.0989	0.0876
0.	0.2391	0.2209	0.2004	0.1816	0.1515	0.1295	0.1130	0.1001
1.0000	0.2698	0.2489	0.2257	0.2045	0.1708	0.1461	0.1275	0.1130
2.0000	0.3011	0.2775	0.2516	0.2280	0.1905	0.1630	0.1423	0.1262
3.0000	0.3330	0.3066	0.2779	0.2519	0.2106	0.1804	0.1575	0.1397
4.0000	0.3654	0.3362	0.3048	0.2764	0.2311	0.1981	0.1731	0.1536
5.0000	0.3983	0.3663	0.3321	0.3012	0.2521	0.2161	0.1889	0.1677
10.0000	0.5684	0.5225	0.4741	0.4306	0.3615	0.3107	0.2721	0.2418
15.0000	0.7443	0.6848	0.6222	0.5660	0.4765	0.4104	0.3599	0.3203

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2364	0.1659	0.1208	0.0931	0.0627	0.0470	0.0375	0.0312
-10.0000	0.2539	0.1803	0.1328	0.1034	0.0707	0.0534	0.0429	0.0358
-5.0000	0.2817	0.2050	0.1546	0.1227	0.0863	0.0666	0.0543	0.0458
-4.0000	0.2884	0.2111	0.1600	0.1276	0.0904	0.0700	0.0573	0.0485
-3.0000	0.2955	0.2176	0.1658	0.1328	0.0947	0.0737	0.0605	0.0513
-2.0000	0.3030	0.2244	0.1720	0.1384	0.0993	0.0776	0.0639	0.0543
-1.0000	0.3108	0.2316	0.1785	0.1442	0.1042	0.0818	0.0675	0.0575
0.	0.3190	0.2391	0.1853	0.1504	0.1093	0.0862	0.0713	0.0609
1.0000	0.3275	0.2470	0.1925	0.1569	0.1148	0.0909	0.0754	0.0645
2.0000	0.3364	0.2552	0.2000	0.1637	0.1204	0.0957	0.0796	0.0683
3.0000	0.3455	0.2637	0.2077	0.1708	0.1264	0.1008	0.0841	0.0722
4.0000	0.3550	0.2726	0.2158	0.1781	0.1326	0.1061	0.0887	0.0763
5.0000	0.3647	0.2817	0.2242	0.1858	0.1390	0.1116	0.0935	0.0806
10.0000	0.4174	0.3314	0.2699	0.2276	0.1743	0.1420	0.1202	0.1043
15.0000	0.4755	0.3867	0.3211	0.2747	0.2143	0.1766	0.1505	0.1313

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.2340	-0.3322	-0.4270	-0.5086	-0.6337	-0.7196	-0.7818	-0.8290
-10.0000	0.0675	0.0608	0.0525	0.0419	0.0202	0.0003	-0.0143	-0.0266
-5.0000	0.4407	0.5507	0.6558	0.7428	0.8719	0.9599	1.0225	1.0714
-4.0000	0.5117	0.6401	0.7625	0.8636	1.0128	1.1139	1.1849	1.2395
-3.0000	0.5786	0.7230	0.8592	0.9712	1.1342	1.2448	1.3233	1.3820
-2.0000	0.6409	0.7985	0.9448	1.0646	1.2378	1.3534	1.4351	1.4960
-1.0000	0.6981	0.8651	1.0193	1.1435	1.3203	1.4386	1.5216	1.5830
0.	0.7495	0.9239	1.0815	1.2074	1.3861	1.5023	1.5849	1.6437
1.0000	0.7949	0.9731	1.1318	1.2573	1.4331	1.5464	1.6255	1.6830
2.0000	0.8341	1.0140	1.1716	1.2949	1.4663	1.5747	1.6498	1.7029
3.0000	0.8676	1.0465	1.2013	1.3204	1.4841	1.5883	1.6577	1.7092
4.0000	0.8950	1.0710	1.2218	1.3369	1.4912	1.5896	1.6557	1.7034
5.0000	0.9170	1.0889	1.2339	1.3431	1.4898	1.5810	1.6425	1.6862
10.0000	0.9559	1.0957	1.2065	1.2864	1.3895	1.4516	1.4919	1.5205
15.0000	0.9140	1.0193	1.0991	1.1549	1.2255	1.2670	1.2942	1.3132

TABLE III.- CONTINUED

(c) $\delta = 50°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1177	0.1030	0.0899	0.0794	0.0643	0.0541	0.0467	0.0411
-10.0000	0.0188	0.0151	0.0125	0.0107	0.0085	0.0071	0.0062	0.0056
-5.0000	-0.1037	-0.0949	-0.0855	-0.0772	-0.0640	-0.0545	-0.0473	-0.0417
-4.0000	-0.1307	-0.1193	-0.1074	-0.0968	-0.0803	-0.0684	-0.0594	-0.0524
-3.0000	-0.1585	-0.1445	-0.1299	-0.1171	-0.0972	-0.0828	-0.0720	-0.0636
-2.0000	-0.1870	-0.1703	-0.1531	-0.1380	-0.1146	-0.0977	-0.0850	-0.0751
-1.0000	-0.2162	-0.1968	-0.1769	-0.1595	-0.1326	-0.1131	-0.0984	-0.0870
0.	-0.2461	-0.2239	-0.2013	-0.1816	-0.1510	-0.1289	-0.1122	-0.0993
1.0000	-0.2766	-0.2516	-0.2262	-0.2042	-0.1699	-0.1451	-0.1264	-0.1119
2.0000	-0.3077	-0.2799	-0.2518	-0.2273	-0.1893	-0.1617	-0.1410	-0.1248
3.0000	-0.3393	-0.3087	-0.2778	-0.2509	-0.2091	-0.1787	-0.1559	-0.1380
4.0000	-0.3714	-0.3380	-0.3043	-0.2749	-0.2293	-0.1961	-0.1711	-0.1515
5.0000	-0.4040	-0.3678	-0.3312	-0.2994	-0.2498	-0.2138	-0.1866	-0.1654
10.0000	-0.5727	-0.5223	-0.4714	-0.4270	-0.3575	-0.3067	-0.2682	-0.2380
15.0000	-0.7470	-0.6826	-0.6175	-0.5605	-0.4708	-0.4048	-0.3544	-0.3149

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.2353	-0.2074	-0.1817	-0.1608	-0.1302	-0.1093	-0.0943	-0.0828
-10.0000	-0.1087	-0.0950	-0.0829	-0.0733	-0.0594	-0.0499	-0.0431	-0.0380
-5.0000	0.0406	0.0384	0.0353	0.0322	0.0269	0.0229	0.0199	0.0175
-4.0000	0.0728	0.0673	0.0610	0.0551	0.0458	0.0389	0.0337	0.0297
-3.0000	0.1057	0.0968	0.0872	0.0787	0.0652	0.0554	0.0480	0.0423
-2.0000	0.1392	0.1269	0.1141	0.1028	0.0850	0.0722	0.0626	0.0552
-1.0000	0.1733	0.1576	0.1415	0.1273	0.1053	0.0894	0.0776	0.0684
0.	0.2080	0.1889	0.1694	0.1524	0.1260	0.1070	0.0929	0.0819
1.0000	0.2432	0.2206	0.1978	0.1779	0.1471	0.1250	0.1085	0.0957
2.0000	0.2788	0.2528	0.2266	0.2038	0.1686	0.1433	0.1244	0.1098
3.0000	0.3150	0.2855	0.2558	0.2301	0.1904	0.1619	0.1406	0.1241
4.0000	0.3515	0.3185	0.2854	0.2567	0.2125	0.1807	0.1570	0.1387
5.0000	0.3883	0.3518	0.3153	0.2837	0.2349	0.1998	0.1737	0.1534
10.0000	0.5762	0.5223	0.4686	0.4221	0.3502	0.2985	0.2598	0.2297
15.0000	0.7658	0.6951	0.6245	0.5634	0.4686	0.4001	0.3486	0.3086

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3394	0.2425	0.1791	0.1396	0.0954	0.0721	0.0579	0.0484
-10.0000	0.3503	0.2500	0.1844	0.1436	0.0979	0.0739	0.0592	0.0494
-5.0000	0.3718	0.2681	0.1999	0.1569	0.1085	0.0826	0.0667	0.0559
-4.0000	0.3773	0.2729	0.2041	0.1607	0.1116	0.0852	0.0689	0.0578
-3.0000	0.3833	0.2782	0.2087	0.1648	0.1149	0.0880	0.0713	0.0600
-2.0000	0.3896	0.2838	0.2137	0.1693	0.1186	0.0911	0.0740	0.0623
-1.0000	0.3963	0.2899	0.2191	0.1741	0.1226	0.0945	0.0769	0.0649
0.	0.4034	0.2963	0.2248	0.1792	0.1268	0.0981	0.0801	0.0676
1.0000	0.4108	0.3031	0.2309	0.1847	0.1314	0.1020	0.0834	0.0706
2.0000	0.4186	0.3102	0.2374	0.1905	0.1362	0.1061	0.0870	0.0738
3.0000	0.4268	0.3177	0.2441	0.1967	0.1413	0.1104	0.0908	0.0771
4.0000	0.4352	0.3255	0.2512	0.2031	0.1466	0.1150	0.0947	0.0806
5.0000	0.4440	0.3337	0.2587	0.2098	0.1523	0.1198	0.0989	0.0843
10.0000	0.4925	0.3792	0.3003	0.2478	0.1840	0.1471	0.1228	0.1054
15.0000	0.5474	0.4313	0.3485	0.2919	0.2214	0.1792	0.1508	0.1303

L/D

α, deg \ m	.25	.50	75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.3587	-0.4778	-0.5870	-0.6754	-0.8031	-0.8875	-0.9473	-0.9893
-10.0000	-0.1270	-0.1909	-0.2532	-0.3065	-0.3888	-0.4458	-0.4889	-0.5221
-5.0000	0.1986	0.2336	0.2682	0.2981	0.3429	0.3738	0.3962	0.4118
-4.0000	0.2665	0.3221	0.3767	0.4229	0.4945	0.5439	0.5788	0.6055
-3.0000	0.3330	0.4078	0.4808	0.5436	0.6389	0.7052	0.7522	0.7865
-2.0000	0.3972	0.4897	0.5797	0.6560	0.7709	0.8510	0.9077	0.9504
-1.0000	0.4582	0.5665	0.6708	0.7583	0.8897	0.9797	1.0450	1.0915
0.	0.5156	0.6375	0.7536	0.8504	0.9937	1.0907	1.1598	1.2115
1.0000	0.5687	0.7014	0.8268	0.9301	1.0809	1.1827	1.2550	1.3071
2.0000	0.6168	0.7585	0.8899	0.9976	1.1531	1.2564	1.3286	1.3811
3.0000	0.6601	0.8082	0.9437	1.0528	1.2097	1.3132	1.3838	1.4361
4.0000	0.6983	0.8504	0.9877	1.0970	1.2526	1.3527	1.4230	1.4736
5.0000	0.7311	0.8851	1.0223	1.1310	1.2819	1.3791	1.4466	1.4943
10.0000	0.8237	0.9664	1.0855	1.1743	1.2930	1.3646	1.4124	1.4470
15.0000	0.8227	0.9384	1.0296	1.0956	1.1796	1.2293	1.2620	1.2850

TABLE III.- CONTINUED

(d) δ = 60°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2365	0.2102	0.1849	0.1637	0.1324	0.1110	0.0956	0.0839
-10.0000	0.1152	0.0940	0.0829	0.0735	0.0595	0.0499	0.0431	0.0379
-5.0000	-0.0495	-0.0441	-0.0393	-0.0354	-0.0295	-0.0251	-0.0218	-0.0192
-4.0000	-0.0878	-0.0740	-0.0659	-0.0592	-0.0490	-0.0416	-0.0361	-0.0317
-3.0000	-0.1162	-0.1045	-0.0930	-0.0835	-0.0690	-0.0586	-0.0508	-0.0447
-2.0000	-0.1516	-0.1357	-0.1208	-0.1084	-0.0895	-0.0760	-0.0658	-0.0580
-1.0000	-0.1869	-0.1675	-0.1491	-0.1338	-0.1104	-0.0937	-0.0813	-0.0716
0.	-0.2228	-0.1998	-0.1780	-0.1597	-0.1318	-0.1119	-0.0970	-0.0855
1.0000	-0.2593	-0.2327	-0.2073	-0.1861	-0.1536	-0.1304	-0.1131	-0.0998
2.0000	-0.2963	-0.2660	-0.2372	-0.2129	-0.1758	-0.1493	-0.1295	-0.1143
3.0000	-0.3337	-0.2998	-0.2674	-0.2401	-0.1983	-0.1685	-0.1462	-0.1290
4.0000	-0.3715	-0.3339	-0.2980	-0.2676	-0.2212	-0.1880	-0.1632	-0.1440
5.0000	-0.4296	-0.3685	-0.3289	-0.2955	-0.2444	-0.2078	-0.1804	-0.1592
10.0000	-0.6042	-0.5449	-0.4876	-0.4388	-0.3637	-0.3097	-0.2693	-0.2380
15.0000	-0.8015	-0.7238	-0.6491	-0.5851	-0.4862	-0.4148	-0.3611	-0.3194

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.3437	-0.3057	-0.2693	-0.2388	-0.1936	-0.1624	-0.1398	-0.1228
-10.0000	-0.1929	-0.1720	-0.1518	-0.1347	-0.1094	-0.0919	-0.0792	-0.0696
-5.0000	-0.0213	-0.0190	-0.0165	-0.0144	-0.0113	-0.0093	-0.008C	-0.0071
-4.0000	0.0151	0.0135	0.0123	0.0113	0.0097	0.0084	0.0073	0.0064
-3.0000	0.0520	0.0466	0.0416	0.0375	0.0311	0.0265	0.0229	0.0202
-2.0000	0.0895	0.0802	0.0714	0.0641	0.0529	0.0449	0.0389	0.0342
-1.0000	0.1275	0.1142	0.1016	0.0911	0.0751	0.0636	0.0551	0.0485
0.	0.1659	0.1487	0.1323	0.1185	0.0976	0.0827	0.0715	0.0630
1.0000	0.2047	0.1835	0.1633	0.1463	0.1204	0.1020	0.0883	0.0777
2.0000	0.2439	0.2187	0.1946	0.1743	0.1435	0.1215	0.1052	0.0926
3.0000	0.2834	0.2542	0.2262	0.2027	0.1668	0.1413	0.1223	0.1077
4.0000	0.3231	0.2899	0.2581	0.2312	0.1903	0.1612	0.1396	0.1230
5.0000	0.3631	0.3259	0.2902	0.2600	0.2140	0.1813	0.1571	0.1384
10.0000	0.5642	0.5073	0.4524	0.4057	0.3344	0.2837	0.2459	0.2169
15.0000	0.7632	0.6874	0.6139	0.5512	0.4552	0.3866	0.3355	0.2961

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.4315	0.3113	0.2324	0.1827	0.1266	0.0965	0.0779	0.0654
-10.0000	0.4343	0.3139	0.2302	0.1798	0.1233	0.0933	0.0750	0.0626
-5.0000	0.4470	0.3211	0.2383	0.1865	0.1283	0.0973	0.0783	0.0654
-4.0000	0.4519	0.3245	0.2412	0.1870	0.1303	0.0990	0.0797	0.0666
-3.0000	0.4563	0.3282	0.2444	0.1918	0.1326	0.1009	0.0813	0.0681
-2.0000	0.4611	0.3324	0.2481	0.1951	0.1352	0.1031	0.0832	0.0698
-1.0000	0.4663	0.3370	0.2521	0.1987	0.1381	0.1056	0.0854	0.0716
0.	0.4719	0.3420	0.2565	0.2026	0.1414	0.1083	0.0877	0.0737
1.0000	0.4779	0.3474	0.2613	0.2069	0.1450	0.1113	0.0904	0.0760
2.0000	0.4842	0.3531	0.2665	0.2116	0.1488	0.1146	0.0932	0.0785
3.0000	0.4910	0.3593	0.2721	0.2166	0.1530	0.1182	0.0963	0.0813
4.0000	0.4981	0.3658	0.2780	0.2220	0.1575	0.1220	0.0996	0.0842
5.0000	0.5055	0.3727	0.2843	0.2277	0.1622	0.1260	0.1031	0.0873
10.0000	0.5478	0.4125	0.3207	0.2609	0.1901	0.1499	0.1239	0.1057
15.0000	0.5974	0.4599	0.3646	0.3012	0.2242	0.1792	0.1495	0.1283

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.4356	-0.5653	-0.6799	-0.7696	-0.8947	-0.9752	-1.0303	-1.0709
-10.0000	-0.2484	-0.3436	-0.4328	-0.5060	-0.6148	-0.6890	-0.7416	-0.7822
-5.0000	0.0398	0.0282	0.0181	0.0102	-0.0006	-0.0080	-0.0146	-0.0209
-4.0000	0.1036	0.1119	0.1214	0.1303	0.1451	0.1557	0.1626	0.1671
-3.0000	0.1674	0.1959	0.2246	0.2505	0.2905	0.3194	0.3391	0.3545
-2.0000	0.2306	0.2785	0.3260	0.3677	0.4321	0.4777	0.5108	0.5340
-1.0000	0.2923	0.3584	0.4234	0.4798	0.5666	0.6263	0.6702	0.7031
0.	0.3516	0.4348	0.5158	0.5849	0.6902	0.7636	0.8153	0.8548
1.0000	0.4078	0.5061	0.6009	0.6812	0.8013	0.8848	0.9432	0.9873
2.0000	0.4607	0.5721	0.6780	0.7667	0.8992	0.9887	1.0524	1.0994
3.0000	0.5094	0.6317	0.7464	0.8421	0.9817	1.0756	1.1416	1.1897
4.0000	0.5536	0.6846	0.8062	0.9056	1.0496	1.1455	1.2128	1.2620
5.0000	0.5935	0.7313	0.8568	0.9586	1.1044	1.2003	1.2673	1.3154
10.0000	0.7224	0.8658	0.9885	1.0820	1.2080	1.2868	1.3396	1.3773
15.0000	0.7521	0.8759	0.9756	1.0481	1.1414	1.1973	1.2341	1.2605

TABLE III.- CONTINUED

(e) δ = 70°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3755	0.3354	0.2961	0.2628	0.2130	0.1786	0.1537	0.1348
-10.0000	0.2138	0.1920	0.1700	0.1511	0.1226	0.1030	0.0887	0.0779
-5.0000	0.0306	0.0287	0.0256	0.0227	0.0181	0.0150	0.0129	0.0114
-4.0000	-0.0081	-0.0060	-0.0050	-0.0047	-0.0042	-0.0038	-0.0033	-0.0029
-3.0000	-0.0474	-0.0411	-0.0362	-0.0325	-0.0270	-0.0230	-0.0199	-0.0175
-2.0000	-0.0873	-0.0768	-0.0679	-0.0608	-0.0501	-0.0425	-0.0368	-0.0324
-1.0000	-0.1276	-0.1130	-0.1000	-0.0895	-0.0736	-0.0624	-0.0540	-0.0475
0.	-0.1685	-0.1496	-0.1325	-0.1185	-0.0975	-0.0825	-0.0714	-0.0628
1.0000	-0.2096	-0.1865	-0.1654	-0.1479	-0.1216	-0.1029	-0.0890	-0.0783
2.0000	-0.2512	-0.2238	-0.1986	-0.1776	-0.1460	-0.1236	-0.1069	-0.0941
3.0000	-0.2930	-0.2614	-0.2321	-0.2076	-0.1707	-0.1444	-0.1250	-0.1100
4.0000	-0.3351	-0.2993	-0.2658	-0.2378	-0.1955	-0.1655	-0.1432	-0.1261
5.0000	-0.3774	-0.3373	-0.2997	-0.2682	-0.2205	-0.1867	-0.1616	-0.1423
10.0000	-0.5898	-0.5288	-0.4709	-0.4219	-0.3474	-0.2944	-0.2550	-0.2247
15.0000	-0.7992	-0.7183	-0.6407	-0.5749	-0.4742	-0.4022	-0.3487	-0.3075

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.4472	-0.3994	-0.3529	-0.3136	-0.2547	-0.2138	-0.1841	-0.1616
-10.0000	-0.2764	-0.2475	-0.2191	-0.1949	-0.1585	-0.1331	-0.1147	-0.1008
-5.0000	-0.0875	-0.0786	-0.0697	-0.0620	-0.0503	-0.0422	-0.0363	-0.0319
-4.0000	-0.0473	-0.0432	-0.0384	-0.0341	-0.0275	-0.0230	-0.0198	-0.0174
-3.0000	-0.0272	-0.0073	-0.0066	-0.0057	-0.0044	-0.0035	-0.0030	-0.0026
-2.0000	0.0333	0.0289	0.0255	0.0229	0.0190	0.0162	0.0140	0.0124
-1.0000	0.0742	0.0655	0.0580	0.0519	0.0427	0.0362	0.0313	0.0275
0.	0.1154	0.1024	0.0907	0.0811	0.0666	0.0563	0.0487	0.0428
1.0000	0.1568	0.1396	0.1237	0.1105	0.0907	0.0767	0.0663	0.0583
2.0000	0.1985	0.1769	0.1563	0.1402	0.1150	0.0972	0.0840	0.0739
3.0000	0.2404	0.2145	0.1902	0.1700	0.1394	0.1178	0.1018	0.0896
4.0000	0.2824	0.2521	0.2237	0.1999	0.1640	0.1385	0.1197	0.1054
5.0000	0.3244	0.2899	0.2573	0.2300	0.1886	0.1594	0.1378	0.1212
10.0000	0.5339	0.4781	0.4250	0.3801	0.3120	0.2638	0.2282	0.2009
15.0000	0.7373	0.6615	0.5897	0.5270	0.4331	0.3665	0.3172	0.2793

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.5091	0.3701	0.2787	0.2209	0.1549	0.1190	0.0966	0.0813
-10.0000	0.5029	0.3610	0.2687	0.2108	0.1457	0.1108	0.0893	0.0747
-5.0000	0.5074	0.3629	0.2690	0.2105	0.1448	0.1098	0.0883	0.0737
-4.0000	0.5096	0.3645	0.2703	0.2116	0.1456	0.1105	0.0888	0.0742
-3.0000	0.5122	0.3665	0.2721	0.2131	0.1468	0.1114	0.0897	0.0749
-2.0000	0.5152	0.3691	0.2742	0.2150	0.1483	0.1127	0.0907	0.0759
-1.0000	0.5146	0.3720	0.2768	0.2172	0.1501	0.1142	0.0921	0.0770
0.	0.5274	0.3754	0.2797	0.2199	0.1523	0.1162	0.0936	0.0784
1.0000	0.5267	0.3792	0.2831	0.2229	0.1548	0.1182	0.0955	0.0800
2.0000	0.5313	0.3834	0.2867	0.2263	0.1576	0.1205	0.0975	0.0819
3.0000	0.5363	0.3880	0.2910	0.2300	0.1607	0.1232	0.0998	0.0839
4.0000	0.5417	0.3930	0.2956	0.2342	0.1642	0.1262	0.1024	0.0862
5.0000	0.5475	0.3984	0.3005	0.2386	0.1679	0.1294	0.1052	0.0886
10.0000	0.5813	0.4311	0.3307	0.2663	0.1912	0.1493	0.1226	0.1040
15.0000	0.6245	0.4725	0.3694	0.3020	0.2215	0.1753	0.1453	0.1241

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.4942	-0.6293	-0.7454	-0.8343	-0.9554	-1.0319	-1.0842	-1.1221
-10.0000	-0.3403	-0.4543	-0.5587	-0.6434	-0.7648	-0.8458	-0.9035	-0.9476
-5.0000	-0.0827	-0.1268	-0.1678	-0.2018	-0.2522	-0.2872	-0.3124	-0.3327
-4.0000	-0.0227	-0.0482	-0.0714	-0.0902	-0.1174	-0.1362	-0.1507	-0.1619
-3.0000	0.0383	0.0325	0.0256	0.0281	0.0224	0.0210	0.0189	0.0177
-2.0000	0.0798	0.1135	0.1283	0.1420	0.1638	0.1796	0.1903	0.1994
-1.0000	0.1609	0.1941	0.2278	0.2575	0.3034	0.3363	0.3594	0.3769
0.	0.2209	0.2728	0.3243	0.3688	0.4373	0.4845	0.5203	0.5459
1.0000	0.2788	0.3484	0.4163	0.4742	0.5627	0.6244	0.6687	0.7024
2.0000	0.3343	0.4197	0.5024	0.5722	0.6775	0.7506	0.8025	0.8409
3.0000	0.3868	0.4863	0.5813	0.6611	0.7796	0.8606	0.9185	0.9617
4.0000	0.4355	0.5472	0.6523	0.7395	0.8682	0.9543	1.0160	1.0620
5.0000	0.4801	0.6019	0.7152	0.8083	0.9431	1.0330	1.0967	1.1436
10.0000	0.6380	0.7831	0.9040	0.9995	1.1333	1.2127	1.2686	1.3094
15.0000	0.6933	0.8232	0.9290	1.0065	1.1072	1.1683	1.2083	1.2368

TABLE III.- CONCLUDED

(f) δ = 80°

c_m

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.5184	0.4636	0.4102	0.3649	0.2967	0.2492	0.2146	0.1884
-10.0000	0.3314	0.2971	0.2632	0.2343	0.1907	0.1602	0.1381	0.1213
-5.0000	0.1263	0.1140	0.1013	0.0902	0.0733	0.0616	0.0531	0.0466
-4.0000	0.0837	0.0759	0.0675	0.0601	0.0488	0.0410	0.0353	0.0310
-3.0000	0.0406	0.0374	0.0334	0.0297	0.0240	0.0201	0.0173	0.0152
-2.0000	-0.0028	-0.0014	-0.0010	-0.0009	-0.0010	-0.0010	-0.0009	-0.0008
-1.0000	-0.0465	-0.0406	-0.0357	-0.0319	-0.0263	-0.0223	-0.0193	-0.0170
0.	-0.0905	-0.0799	-0.0706	-0.0631	-0.0518	-0.0438	-0.0378	-0.0332
1.0000	-0.1347	-0.1195	-0.1058	-0.0944	-0.0774	-0.0654	-0.0564	-0.0496
2.0000	-0.1771	-0.1593	-0.1410	-0.1259	-0.1031	-0.0871	-0.0752	-0.0661
3.0000	-0.2236	-0.1991	-0.1764	-0.1575	-0.1290	-0.1089	-0.0940	-0.0827
4.0000	-0.2681	-0.2390	-0.2119	-0.1892	-0.1549	-0.1307	-0.1129	-0.0993
5.0000	-0.3126	-0.2789	-0.2473	-0.2209	-0.1808	-0.1526	-0.1318	-0.1159
10.0000	-0.5331	-0.4769	-0.4234	-0.3784	-0.3100	-0.2617	-0.2261	-0.1989
15.0000	-0.7454	-0.6679	-0.5936	-0.5308	-0.4352	-0.3677	-0.3178	-0.2797

c_N

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.5420	-0.4847	-0.4291	-0.3820	-0.3109	-0.2614	-0.2252	-0.1978
-10.0000	-0.3556	-0.3185	-0.2822	-0.2513	-0.2047	-0.1721	-0.1484	-0.1303
-5.0000	-0.1532	-0.1377	-0.1222	-0.1088	-0.0886	-0.0745	-0.0642	-0.0564
-4.0000	-0.1113	-0.1002	-0.0890	-0.0793	-0.0645	-0.0542	-0.0467	-0.0411
-3.0000	-0.0691	-0.0625	-0.0556	-0.0495	-0.0402	-0.0338	-0.0291	-0.0256
-2.0000	-0.0266	-0.0245	-0.0219	-0.0194	-0.0157	-0.0131	-0.0113	-0.0099
-1.0000	0.0162	0.0138	0.0120	0.0108	0.0090	0.0076	0.0066	0.0058
0.	0.0591	0.0522	0.0461	0.0412	0.0338	0.0285	0.0247	0.0217
1.0000	0.1022	0.0907	0.0803	0.0717	0.0587	0.0495	0.0428	0.0376
2.0000	0.1453	0.1294	0.1146	0.1022	0.0837	0.0706	0.0609	0.0536
3.0000	0.1885	0.1681	0.1489	0.1329	0.1087	0.0917	0.0791	0.0696
4.0000	0.2317	0.2067	0.1832	0.1635	0.1337	0.1128	0.0974	0.0856
5.0000	0.2748	0.2453	0.2175	0.1941	0.1588	0.1339	0.1156	0.1016
10.0000	0.4873	0.4359	0.3868	0.3453	0.2826	0.2383	0.2058	0.1810
15.0000	0.6901	0.6180	0.5488	0.4903	0.4014	0.3387	0.2926	0.2573

c_A

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.5693	0.4170	0.3167	0.2528	0.1792	0.1387	0.1131	0.0956
-10.0000	0.5537	0.3992	0.2987	0.2357	0.1641	0.1255	0.1015	0.0852
-5.0000	0.5483	0.3920	0.2911	0.2281	0.1574	0.1195	0.0962	0.0805
-4.0000	0.5485	0.3919	0.2908	0.2278	0.1570	0.1192	0.0959	0.0802
-3.0000	0.5491	0.3922	0.2909	0.2279	0.1570	0.1192	0.0959	0.0801
-2.0000	0.5501	0.3930	0.2915	0.2283	0.1573	0.1194	0.0961	0.0803
-1.0000	0.5516	0.3941	0.2925	0.2292	0.1580	0.1200	0.0966	0.0807
0.	0.5534	0.3957	0.2939	0.2304	0.1590	0.1208	0.0973	0.0814
1.0000	0.5557	0.3978	0.2957	0.2320	0.1604	0.1220	0.0983	0.0822
2.0000	0.5584	0.4002	0.2979	0.2341	0.1620	0.1234	0.0995	0.0833
3.0000	0.5615	0.4031	0.3004	0.2365	0.1641	0.1251	0.1010	0.0847
4.0000	0.5649	0.4064	0.3036	0.2393	0.1664	0.1272	0.1028	0.0862
5.0000	0.5688	0.4102	0.3071	0.2424	0.1691	0.1294	0.1048	0.0880
10.0000	0.5941	0.4349	0.3303	0.2638	0.1873	0.1451	0.1184	0.1001
15.0000	0.6284	0.4692	0.3628	0.2940	0.2130	0.1672	0.1378	0.1172

L/D

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.5451	-0.6820	-0.7974	-0.8849	-1.0014	-1.0742	-1.1237	-1.1587
-10.0000	-0.4135	-0.5449	-0.6587	-0.7490	-0.8780	-0.9623	-1.0222	-1.0656
-5.0000	-0.1873	-0.2559	-0.3205	-0.3739	-0.4531	-0.5082	-0.5479	-0.5777
-4.0000	-0.1311	-0.1825	-0.2312	-0.2716	-0.3314	-0.3729	-0.4033	-0.4272
-3.0000	-0.0730	-0.1061	-0.1373	-0.1629	-0.2009	-0.2278	-0.2471	-0.2628
-2.0000	-0.0134	-0.0274	-0.0401	-0.0499	-0.0647	-0.0745	-0.0823	-0.0880
-1.0000	0.0468	0.0525	0.0585	0.0646	0.0745	0.0809	0.0859	0.0894
0.	0.1068	0.1319	0.1560	0.1788	0.2126	0.2359	0.2539	0.2666
1.0000	0.1653	0.2097	0.2529	0.2900	0.3463	0.3856	0.4148	0.4365
2.0000	0.2233	0.2852	0.3451	0.3956	0.4732	0.5267	0.5651	0.5952
3.0000	0.2784	0.3568	0.4317	0.4950	0.5895	0.6554	0.7013	0.7376
4.0000	0.3307	0.4236	0.5119	0.5853	0.6945	0.7692	0.8233	0.8632
5.0000	0.3776	0.4851	0.5845	0.6666	0.7867	0.8686	0.9262	0.9692
10.0000	0.5625	0.7019	0.8245	0.9202	1.0525	1.1368	1.1955	1.2374
15.0000	0.6415	0.7755	0.8857	0.9674	1.0742	1.1393	1.1826	1.2136

TABLE IV.- LONGITUDINAL AERODYNAMICS OF RAKED-OFF ELLIPTICAL CONES $\theta_{xz} = 30°$

(a) $\delta = 40°$

C_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0987	-0.0945	-0.0893	-0.0838	-0.0739	-0.0657	-0.0590	-0.0536
-10.0000	-0.1637	-0.1575	-0.1496	-0.1413	-0.1257	-0.1126	-0.1017	-0.0927
-5.0000	-0.2411	-0.2326	-0.2216	-0.2100	-0.1880	-0.1691	-0.1534	-0.1401
-4.0000	-0.2579	-0.2489	-0.2373	-0.2250	-0.2015	-0.1814	-0.1646	-0.1505
-3.0000	-0.2750	-0.2656	-0.2533	-0.2402	-0.2154	-0.1941	-0.1762	-0.1611
-2.0000	-0.2925	-0.2826	-0.2696	-0.2559	-0.2296	-0.2070	-0.1880	-0.1720
-1.0000	-0.3134	-0.2999	-0.2863	-0.2718	-0.2441	-0.2202	-0.2000	-0.1831
0.	-0.3285	-0.3176	-0.3033	-0.2881	-0.2589	-0.2336	-0.2124	-0.1944
1.0000	-0.3470	-0.3355	-0.3206	-0.3046	-0.2739	-0.2473	-0.2249	-0.2060
2.0000	-0.3657	-0.3537	-0.3381	-0.3213	-0.2891	-0.2612	-0.2376	-0.2177
3.0000	-0.3847	-0.3722	-0.3559	-0.3384	-0.3046	-0.2753	-0.2505	-0.2296
4.0000	-0.4039	-0.3909	-0.3739	-0.3556	-0.3203	-0.2896	-0.2637	-0.2417
5.0000	-0.4233	-0.4098	-0.3921	-0.3730	-0.3362	-0.3041	-0.2769	-0.2539
10.0000	-0.5226	-0.5065	-0.4852	-0.4622	-0.4176	-0.3784	-0.3451	-0.3168
15.0000	-0.6233	-0.6047	-0.5800	-0.5531	-0.5006	-0.4544	-0.4148	-0.3811

C_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1138	0.1072	0.0995	0.0919	0.0789	0.0688	0.0608	0.0545
-10.0000	0.2138	0.2029	0.1897	0.1766	0.1534	0.1348	0.1200	0.1081
-5.0000	0.3337	0.3149	0.2957	0.2763	0.2416	0.2133	0.1907	0.1722
-4.0000	0.3558	0.3390	0.3185	0.2978	0.2606	0.2303	0.2063	0.1861
-3.0000	0.3813	0.3635	0.3418	0.3197	0.2801	0.2477	0.2216	0.2004
-2.0000	0.4074	0.3886	0.3655	0.3421	0.3000	0.2655	0.2376	0.2149
-1.0000	0.4339	0.4140	0.3897	0.3649	0.3202	0.2836	0.2540	0.2298
0.	0.4628	0.4399	0.4142	0.3881	0.3408	0.3020	0.2706	0.2449
1.0000	0.4880	0.4661	0.4391	0.4116	0.3617	0.3207	0.2875	0.2602
2.0000	0.5156	0.4927	0.4643	0.4355	0.3830	0.3397	0.3046	0.2758
3.0000	0.5436	0.5195	0.4899	0.4596	0.4044	0.3590	0.3220	0.2917
4.0000	0.5717	0.5467	0.5157	0.4840	0.4262	0.3784	0.3396	0.3077
5.0000	0.6002	0.5741	0.5417	0.5086	0.4481	0.3981	0.3574	0.3239
10.0000	0.7446	0.7133	0.6743	0.6341	0.5603	0.4987	0.4484	0.4068
15.0000	0.8897	0.8534	0.8079	0.7609	0.6738	0.6008	0.5408	0.4912

C_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2614	0.2179	0.1796	0.1510	0.1139	0.0916	0.0767	0.0661
-10.0000	0.3230	0.2753	0.2324	0.1995	0.1555	0.1279	0.1089	0.0950
-5.0000	0.3937	0.3419	0.2943	0.2571	0.2054	0.1717	0.1485	0.1302
-4.0000	0.4088	0.3561	0.3077	0.2695	0.2162	0.1813	0.1565	0.1380
-3.0000	0.4241	0.3707	0.3213	0.2822	0.2273	0.1911	0.1653	0.1459
-2.0000	0.4396	0.3855	0.3352	0.2952	0.2387	0.2011	0.1742	0.1540
-1.0000	0.4554	0.4005	0.3493	0.3084	0.2502	0.2113	0.1834	0.1623
0.	0.4714	0.4158	0.3636	0.3218	0.2620	0.2218	0.1928	0.1707
1.0000	0.4876	0.4312	0.3782	0.3355	0.2740	0.2324	0.2023	0.1794
2.0000	0.5039	0.4468	0.3930	0.3493	0.2862	0.2432	0.2120	0.1882
3.0000	0.5204	0.4626	0.4079	0.3633	0.2986	0.2542	0.2218	0.1971
4.0000	0.5370	0.4786	0.4230	0.3775	0.3111	0.2653	0.2318	0.2061
5.0000	0.5537	0.4947	0.4382	0.3918	0.3238	0.2766	0.2419	0.2153
10.0000	0.6392	0.5762	0.5157	0.4650	0.3886	0.3344	0.2940	0.2625
15.0000	0.7222	0.6578	0.5938	0.5371	0.4547	0.3936	0.3473	0.3110

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.7962	0.8753	0.9652	1.0474	1.1796	1.2758	1.3467	1.4023
-10.0000	0.9430	1.0478	1.1595	1.2579	1.4377	1.5111	1.5865	1.6441
-5.0000	1.0010	1.0969	1.1975	1.2828	1.4087	1.4919	1.5508	1.5946
-4.0000	1.0012	1.0948	1.1913	1.2733	1.3927	1.4708	1.5267	1.5662
-3.0000	0.9385	1.0899	1.1821	1.2601	1.3734	1.4469	1.4983	1.5366
-2.0000	0.9938	1.0810	1.1699	1.2441	1.3510	1.4207	1.4688	1.5036
-1.0000	0.9867	1.0705	1.1556	1.2260	1.3269	1.3922	1.4371	1.4697
0.	0.9775	1.0580	1.1392	1.2060	1.3008	1.3616	1.4035	1.4347
1.0000	0.9665	1.0438	1.1209	1.1840	1.2733	1.3304	1.3697	1.3976
2.0000	0.9542	1.0282	1.1011	1.1613	1.2451	1.2985	1.3349	1.3609
3.0000	0.9407	1.0111	1.0806	1.1373	1.2156	1.2662	1.3004	1.3248
4.0000	0.9258	0.9930	1.0589	1.1125	1.1864	1.2334	1.2655	1.2885
5.0000	0.9102	0.9741	1.0366	1.0872	1.1564	1.2006	1.2309	1.2521
10.0000	0.8214	0.8714	0.9193	0.9572	1.0090	1.0412	1.0630	1.0786
15.0000	0.7247	0.7633	0.8007	0.8297	0.8689	0.8932	0.9097	0.9215

TABLE IV.- CONTINUED

(b) δ= 50°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0777	-0.0746	-0.0699	-0.0647	-0.0552	-0.0477	-0.0418	-0.0372
-10.0000	-0.1561	-0.1488	-0.1391	-0.1289	-0.1108	-0.0964	-0.0852	-0.0762
-5.0000	-0.2469	-0.2351	-0.2198	-0.2041	-0.1763	-0.1541	-0.1367	-0.1226
-4.0000	-0.2664	-0.2535	-0.2371	-0.2203	-0.1904	-0.1666	-0.1478	-0.1326
-3.0000	-0.2862	-0.2724	-0.2548	-0.2368	-0.2048	-0.1794	-0.1592	-0.1429
-2.0000	-0.3063	-0.2916	-0.2728	-0.2536	-0.2195	-0.1924	-0.1708	-0.1534
-1.0000	-0.3268	-0.3111	-0.2911	-0.2707	-0.2345	-0.2056	-0.1827	-0.1641
0.	-0.3475	-0.3308	-0.3097	-0.2881	-0.2497	-0.2191	-0.1948	-0.1751
1.0000	-0.3686	-0.3509	-0.3285	-0.3057	-0.2652	-0.2328	-0.2070	-0.1861
2.0000	-0.3898	-0.3712	-0.3476	-0.3235	-0.2808	-0.2467	-0.2195	-0.1974
3.0000	-0.4113	-0.3917	-0.3668	-0.3416	-0.2967	-0.2607	-0.2321	-0.2088
4.0000	-0.4330	-0.4124	-0.3863	-0.3598	-0.3127	-0.2750	-0.2448	-0.2203
5.0000	-0.4549	-0.4332	-0.4059	-0.3782	-0.3289	-0.2893	-0.2577	-0.2320
10.0000	-0.5656	-0.5391	-0.5057	-0.4718	-0.4114	-0.3627	-0.3236	-0.2916
15.0000	-0.6765	-0.6452	-0.6059	-0.5660	-0.4947	-0.4369	-0.3903	-0.3522

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0137	0.0156	0.0163	0.0158	0.0137	0.0117	0.0101	0.0088
-10.0000	0.1291	0.1229	0.1153	0.1048	0.0911	0.0787	0.0690	0.0614
-5.0000	0.2590	0.2452	0.2284	0.2111	0.1804	0.1563	0.1376	0.1227
-4.0000	0.2855	0.2711	0.2525	0.2333	0.1995	0.1729	0.1522	0.1358
-3.0000	0.3134	0.2974	0.2769	0.2559	0.2185	0.1898	0.1672	0.1492
-2.0000	0.3418	0.3242	0.3017	0.2788	0.2386	0.2070	0.1824	0.1628
-1.0000	0.3705	0.3513	0.3269	0.3021	0.2586	0.2245	0.1979	0.1767
0.	0.3996	0.3787	0.3523	0.3257	0.2789	0.2422	0.2136	0.1908
1.0000	0.4287	0.4064	0.3781	0.3495	0.2994	0.2602	0.2295	0.2050
2.0000	0.4595	0.4343	0.4041	0.3736	0.3202	0.2783	0.2456	0.2195
3.0000	0.4893	0.4625	0.4303	0.3979	0.3411	0.2967	0.2618	0.2341
4.0000	0.5183	0.4909	0.4567	0.4223	0.3623	0.3152	0.2783	0.2488
5.0000	0.5485	0.5194	0.4833	0.4470	0.3836	0.3338	0.2948	0.2636
10.0000	0.7002	0.6631	0.6172	0.5713	0.4912	0.4283	0.3787	0.3391
15.0000	0.8502	0.8053	0.7501	0.6950	0.5987	0.5227	0.4629	0.4148

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.4444	0.3650	0.2936	0.2402	0.1723	0.1331	0.1082	0.0911
-10.0000	0.4999	0.4155	0.3380	0.2807	0.2056	0.1513	0.1326	0.1126
-5.0000	0.5625	0.4736	0.3918	0.3289	0.2459	0.1957	0.1628	0.1394
-4.0000	0.5757	0.4859	0.4032	0.3393	0.2547	0.2035	0.1675	0.1453
-3.0000	0.5891	0.4985	0.4148	0.3499	0.2638	0.2113	0.1763	0.1514
-2.0000	0.6027	0.5113	0.4266	0.3608	0.2730	0.2193	0.1834	0.1577
-1.0000	0.6164	0.5243	0.4386	0.3719	0.2825	0.2275	0.1906	0.1641
0.	0.6303	0.5374	0.4509	0.3832	0.2921	0.2358	0.1980	0.1707
1.0000	0.6443	0.5507	0.4632	0.3946	0.3019	0.2444	0.2055	0.1775
2.0000	0.6585	0.5641	0.4758	0.4063	0.3119	0.2531	0.2132	0.1843
3.0000	0.6727	0.5777	0.4885	0.4180	0.3221	0.2619	0.2210	0.1913
4.0000	0.6869	0.5914	0.5013	0.4299	0.3324	0.2709	0.2289	0.1984
5.0000	0.7013	0.6051	0.5142	0.4420	0.3428	0.2800	0.2370	0.2056
10.0000	0.7732	0.6745	0.5800	0.5305	0.3963	0.3270	0.2787	0.2431
15.0000	0.8439	0.7437	0.6460	0.5658	0.4512	0.3754	0.3218	0.2819

L/D

α, deg \ m	.25	50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3013	0.3143	0.3284	0.3397	0.3550	0.3644	0.3706	0.3742
-10.0000	0.4532	0.4981	0.5495	0.5968	0.6719	0.7268	0.7671	0.7984
-5.0000	0.5696	0.6339	0.7065	0.7727	0.8774	0.9518	1.0072	1.0484
-4.0000	0.5862	0.6534	0.7280	0.7958	0.9026	0.9776	1.0327	1.0748
-3.0000	0.6012	0.6697	0.7461	0.8150	0.9223	0.9976	1.0531	1.0944
-2.0000	0.6142	0.6841	0.7609	0.8300	0.9375	1.0122	1.0665	1.1072
-1.0000	0.6251	0.6956	0.7728	0.8417	0.9480	1.0217	1.0752	1.1152
0.	0.6340	0.7047	0.7813	0.8499	0.9548	1.0271	1.0788	1.1178
1.0000	0.6408	0.7114	0.7876	0.8550	0.9577	1.0281	1.0783	1.1150
2.0000	0.6457	0.7157	0.7909	0.8571	0.9574	1.0253	1.0739	1.1099
3.0000	0.6488	0.7181	0.7919	0.8568	0.9537	1.0199	1.0665	1.1007
4.0000	0.6503	0.7184	0.7907	0.8538	0.9478	1.0113	1.0561	1.0886
5.0000	0.6501	0.7170	0.7876	0.8487	0.9395	1.0003	1.0429	1.0741
10.0000	0.6288	0.6876	0.7475	0.7569	0.8725	0.9208	0.9533	0.9780
15.0000	0.5823	0.6316	0.6812	0.7226	0.7812	0.8189	0.8449	0.8632

TABLE IV.- CONTINUED

(c) δ= 60°

c_m

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0104	-0.0108	-0.0108	-0.0103	-0.0090	-0.0077	-0.0067	-0.0058
-10.0000	-0.1015	-0.0959	-0.0889	-0.0818	-0.0695	-0.0599	-0.0524	-0.0465
-5.0000	-0.2047	-0.1926	-0.1780	-0.1636	-0.1391	-0.1202	-0.1055	-0.0939
-4.0000	-0.2265	-0.2131	-0.1969	-0.1810	-0.1540	-0.1331	-0.1169	-0.1040
-3.0000	-0.2487	-0.2339	-0.2161	-0.1987	-0.1691	-0.1463	-0.1285	-0.1144
-2.0000	-0.2711	-0.2549	-0.2356	-0.2167	-0.1845	-0.1596	-0.1403	-0.1249
-1.0000	-0.2938	-0.2763	-0.2553	-0.2349	-0.2001	-0.1732	-0.1523	-0.1356
0.	-0.3168	-0.2979	-0.2753	-0.2533	-0.2159	-0.1870	-0.1644	-0.1465
1.0000	-0.3400	-0.3197	-0.2955	-0.2720	-0.2319	-0.2009	-0.1767	-0.1575
2.0000	-0.3634	-0.3417	-0.3159	-0.2908	-0.2480	-0.2150	-0.1892	-0.1686
3.0000	-0.3870	-0.3639	-0.3365	-0.3098	-0.2644	-0.2292	-0.2018	-0.1799
4.0000	-0.4106	-0.3862	-0.3572	-0.3289	-0.2808	-0.2435	-0.2145	-0.1913
5.0000	-0.4344	-0.4087	-0.3780	-0.3481	-0.2974	-0.2580	-0.2273	-0.2027
10.0000	-0.5540	-0.5215	-0.4828	-0.4452	-0.3811	-0.3312	-0.2921	-0.2609
15.0000	-0.6719	-0.6330	-0.5867	-0.5416	-0.4645	-0.4044	-0.3571	-0.3192

c_N

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1038	-0.0947	-0.0851	-0.0766	-0.0635	-0.0541	-0.0472	-0.0418
-10.0000	0.0242	0.0243	0.0237	0.0224	0.0196	0.0170	0.0149	0.0132
-5.0000	0.1666	0.1571	0.1453	0.1335	0.1133	0.0975	0.0854	0.0757
-4.0000	0.1964	0.1849	0.1708	0.1569	0.1330	0.1145	0.1003	0.0890
-3.0000	0.2266	0.2131	0.1967	0.1806	0.1530	0.1318	0.1154	0.1024
-2.0000	0.2572	0.2417	0.2229	0.2046	0.1733	0.1493	0.1307	0.1161
-1.0000	0.2880	0.2705	0.2494	0.2288	0.1939	0.1670	0.1463	0.1299
0.	0.3191	0.2995	0.2761	0.2533	0.2146	0.1849	0.1620	0.1439
1.0000	0.3504	0.3288	0.3030	0.2780	0.2355	0.2030	0.1778	0.1580
2.0000	0.3818	0.3582	0.3301	0.3028	0.2566	0.2212	0.1938	0.1722
3.0000	0.4134	0.3878	0.3574	0.3278	0.2779	0.2396	0.2100	0.1866
4.0000	0.4452	0.4175	0.3847	0.3530	0.2992	0.2580	0.2262	0.2010
5.0000	0.4769	0.4473	0.4122	0.3781	0.3206	0.2765	0.2425	0.2156
10.0000	0.6355	0.5960	0.5493	0.5042	0.4280	0.3696	0.3244	0.2886
15.0000	0.7898	0.7410	0.6834	0.6277	0.5336	0.4613	0.4052	0.3608

c_A

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.6032	0.4957	0.3981	0.3246	0.2311	0.1774	0.1433	0.1201
-10.0000	0.6484	0.5355	0.4326	0.3546	0.2548	0.1769	0.1599	0.1345
-5.0000	0.6990	0.5813	0.4734	0.3912	0.2847	0.2221	0.1817	0.1536
-4.0000	0.7096	0.5911	0.4823	0.3991	0.2913	0.2277	0.1866	0.1580
-3.0000	0.7204	0.6010	0.4913	0.4073	0.2982	0.2336	0.1917	0.1625
-2.0000	0.7313	0.6111	0.5005	0.4157	0.3052	0.2396	0.1970	0.1671
-1.0000	0.7422	0.6214	0.5099	0.4243	0.3124	0.2458	0.2024	0.1719
0.	0.7533	0.6318	0.5195	0.4331	0.3198	0.2522	0.2080	0.1769
1.0000	0.7645	0.6423	0.5292	0.4420	0.3274	0.2587	0.2137	0.1820
2.0000	0.7758	0.6529	0.5391	0.4511	0.3351	0.2654	0.2196	0.1872
3.0000	0.7871	0.6636	0.5490	0.4603	0.3430	0.2722	0.2256	0.1926
4.0000	0.7984	0.6744	0.5591	0.4697	0.3510	0.2792	0.2317	0.1980
5.0000	0.8098	0.6853	0.5693	0.4791	0.3592	0.2863	0.2380	0.2036
10.0000	0.8667	0.7404	0.6214	0.5279	0.4016	0.3234	0.2707	0.2329
15.0000	0.9223	0.7952	0.6742	0.5779	0.4457	0.3623	0.3053	0.2640

L/D

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0916	0.0732	0.0512	0.0301	-0.0064	-0.0342	-0.0564	-0.0733
-10.0000	0.2151	0.2235	0.2334	0.2422	0.2567	0.2667	0.2740	0.2793
-5.0000	0.3328	0.3664	0.4053	0.4419	0.5030	0.5475	0.5814	0.6065
-4.0000	0.3535	0.3913	0.4348	0.4762	0.5439	0.5937	0.6312	0.6592
-3.0000	0.3731	0.4147	0.4625	0.5076	0.5811	0.6354	0.6757	0.7059
-2.0000	0.3914	0.4365	0.4879	0.5363	0.6149	0.6727	0.7149	0.7479
-1.0000	0.4083	0.4562	0.5109	0.5620	0.6451	0.7052	0.7497	0.7835
0.	0.4236	0.4740	0.5315	0.5849	0.6710	0.7331	0.7788	0.8135
1.0000	0.4374	0.4901	0.5496	0.6049	0.6931	0.7569	0.8029	0.8380
2.0000	0.4495	0.5041	0.5653	0.6218	0.7118	0.7760	0.8223	0.8574
3.0000	0.4601	0.5162	0.5788	0.6360	0.7269	0.7913	0.8376	0.8722
4.0000	0.4694	0.5264	0.5898	0.6476	0.7385	0.8023	0.8484	0.8826
5.0000	0.4769	0.5347	0.5986	0.6564	0.7467	0.8099	0.8552	0.8891
10.0000	0.4932	0.5505	0.6122	0.6665	0.7487	0.8044	0.8438	0.8722
15.0000	0.4786	0.5312	0.5864	0.6338	0.7036	0.7496	0.7814	0.8042

TABLE IV.- CONTINUED

(d) δ = 70°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0965	0.0895	0.0813	0.0736	0.0611	0.0519	0.0451	0.0399
-10.0000	-0.0060	-0.0056	-0.0054	-0.0052	-0.0049	-0.0044	-0.0039	-0.0035
-5.0000	-0.1175	-0.1113	-0.1020	-0.0933	-0.0789	-0.0679	-0.0594	-0.0526
-4.0000	-0.1433	-0.1334	-0.1223	-0.1118	-0.0945	-0.0813	-0.0711	-0.0630
-3.0000	-0.1673	-0.1558	-0.1428	-0.1306	-0.1103	-0.0949	-0.0829	-0.0735
-2.0000	-0.1915	-0.1784	-0.1635	-0.1495	-0.1263	-0.1186	-0.0950	-0.0842
-1.0000	-0.2160	-0.2012	-0.1845	-0.1687	-0.1425	-0.1225	-0.1072	-0.0950
0.	-0.2436	-0.2242	-0.2056	-0.1880	-0.1588	-0.1366	-0.1195	-0.1059
1.0000	-0.2654	-0.2474	-0.2269	-0.2075	-0.1753	-0.1508	-0.1319	-0.1170
2.0000	-0.2934	-0.2707	-0.2483	-0.2271	-0.1919	-0.1651	-0.1444	-0.1281
3.0000	-0.3154	-0.2941	-0.2698	-0.2468	-0.2085	-0.1794	-0.1570	-0.1393
4.0000	-0.3435	-0.3176	-0.2913	-0.2666	-0.2253	-0.1939	-0.1697	-0.1506
5.0000	-0.3656	-0.3411	-0.3130	-0.2864	-0.2421	-0.2084	-0.1824	-0.1619
10.0000	-0.4707	-0.4582	-0.4209	-0.3854	-0.3263	-0.2811	-0.2465	-0.2187
15.0000	-0.6121	-0.5722	-0.5261	-0.4822	-0.4087	-0.3525	-0.3091	-0.2747

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.2300	-0.2133	-0.1940	-0.1759	-0.1463	-0.1246	-0.1083	-0.0957
-10.0000	-0.0908	-0.0841	-0.0764	-0.0691	-0.0572	-0.0485	-0.0422	-0.0373
-5.0000	0.0616	0.0574	0.0528	0.0485	0.0413	0.0356	0.0312	0.0276
-4.0000	0.0932	0.0869	0.0797	0.0730	0.0618	0.0532	0.0465	0.0412
-3.0000	0.1251	0.1166	0.1069	0.0978	0.0826	0.0710	0.0620	0.0549
-2.0000	0.1573	0.1465	0.1343	0.1228	0.1036	0.0890	0.0777	0.0688
-1.0000	0.1897	0.1767	0.1619	0.1479	0.1247	0.1071	0.0935	0.0828
0.	0.2223	0.2071	0.1897	0.1733	0.1460	0.1253	0.1094	0.0969
1.0000	0.2551	0.2376	0.2176	0.1988	0.1674	0.1437	0.1255	0.1111
2.0000	0.2879	0.2682	0.2456	0.2243	0.1890	0.1622	0.1416	0.1254
3.0000	0.3208	0.2989	0.2737	0.2500	0.2106	0.1807	0.1578	0.1398
4.0000	0.3538	0.3296	0.3019	0.2757	0.2322	0.1993	0.1740	0.1542
5.0000	0.3867	0.3603	0.3300	0.3014	0.2539	0.2179	0.1903	0.1686
10.0000	0.5496	0.5124	0.4696	0.4290	0.3616	0.3105	0.2713	0.2405
15.0000	0.7062	0.6588	0.6041	0.5522	0.4658	0.4003	0.3499	0.3104

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.7387	0.6082	0.4899	0.4005	0.2864	0.2204	0.1784	0.1496
-10.0000	0.7704	0.6346	0.5114	0.4184	0.2995	0.2306	0.1868	0.1567
-5.0000	0.8057	0.6656	0.5382	0.4417	0.3180	0.2459	0.1998	0.1680
-4.0000	0.8131	0.6723	0.5441	0.4470	0.3222	0.2495	0.2029	0.1708
-3.0000	0.8206	0.6791	0.5502	0.4525	0.3267	0.2533	0.2062	0.1736
-2.0000	0.8282	0.6860	0.5565	0.4581	0.3314	0.2573	0.2096	0.1767
-1.0000	0.8359	0.6931	0.5629	0.4639	0.3362	0.2614	0.2132	0.1798
0.	0.8436	0.7003	0.5694	0.4699	0.3413	0.2660	0.2170	0.1832
1.0000	0.8514	0.7075	0.5761	0.4760	0.3464	0.2701	0.2209	0.1866
2.0000	0.8593	0.7149	0.5822	0.4823	0.3518	0.2747	0.2249	0.1902
3.0000	0.8671	0.7224	0.5899	0.4887	0.3573	0.2795	0.2291	0.1939
4.0000	0.8750	0.7299	0.5969	0.4952	0.3629	0.2844	0.2334	0.1977
5.0000	0.8829	0.7375	0.6041	0.5019	0.3687	0.2894	0.2378	0.2017
10.0000	0.9225	0.7763	0.6412	0.5369	0.3994	0.3164	0.2617	0.2230
15.0000	0.9610	0.8153	0.6796	0.5738	0.4324	0.3457	0.2878	0.2466

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0401	-0.0756	-0.1158	-0.1532	-0.2136	-0.2583	-0.2917	-0.3174
-10.0000	0.0573	0.0428	0.0262	0.0109	-0.0142	-0.0328	-0.0477	-0.0592
-5.0000	0.1650	0.1750	0.1877	0.1992	0.2199	0.2352	0.2470	0.2554
-4.0000	0.1860	0.2010	0.2186	0.2359	0.2653	0.2874	0.3040	0.3165
-3.0000	0.2065	0.2261	0.2492	0.2716	0.3093	0.3377	0.3587	0.3749
-2.0000	0.2264	0.2503	0.2786	0.3058	0.3514	0.3855	0.4133	0.4301
-1.0000	0.2454	0.2736	0.3066	0.3382	0.3909	0.4302	0.4595	0.4818
0.	0.2635	0.2957	0.3332	0.3688	0.4278	0.4711	0.5041	0.5289
1.0000	0.2807	0.3165	0.3579	0.3973	0.4619	0.5098	0.5453	0.5720
2.0000	0.2966	0.3358	0.3808	0.4233	0.4931	0.5443	0.5819	0.6103
3.0000	0.3115	0.3537	0.4018	0.4472	0.5209	0.5746	0.6142	0.6442
4.0000	0.3252	0.3700	0.4210	0.4686	0.5455	0.6014	0.6421	0.6733
5.0000	0.3376	0.3846	0.4379	0.4874	0.5670	0.6243	0.6661	0.6974
10.0000	0.3796	1.2646	0.4925	0.5458	0.6287	0.6963	0.7274	0.7580
15.0000	0.3901	0.4440	0.5015	0.5521	0.6280	0.6792	0.7149	0.7409

TABLE IV.- CONCLUDED

(e) δ = 80°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2302	0.2141	0.1953	0.1773	0.1477	0.1257	0.1092	0.0964
-10.0000	0.1186	0.1126	0.1010	0.0917	0.0763	0.0649	0.0564	0.0498
-5.0000	-0.0026	-0.0020	-0.0017	-0.0017	-0.0018	-0.0017	-0.0016	-0.0014
-4.0000	-0.0277	-0.0253	-0.0230	-0.0211	-0.0180	-0.0156	-0.0136	-0.0121
-3.0000	-0.0529	-0.0488	-0.0445	-0.0406	-0.0343	-0.0296	-0.0258	-0.0228
-2.0000	-0.0784	-0.0725	-0.0661	-0.0603	-0.0508	-0.0436	-0.0381	-0.0337
-1.0000	-0.1040	-0.0963	-0.0879	-0.0801	-0.0674	-0.0578	-0.0505	-0.0446
0.	-0.1297	-0.1202	-0.1097	-0.1000	-0.0841	-0.0721	-0.0629	-0.0556
1.0000	-0.1555	-0.1442	-0.1317	-0.1200	-0.1009	-0.0865	-0.0754	-0.0667
2.0000	-0.1813	-0.1683	-0.1537	-0.1401	-0.1177	-0.1008	-0.0879	-0.0778
3.0000	-0.2072	-0.1923	-0.1757	-0.1602	-0.1346	-0.1153	-0.1005	-0.0889
4.0000	-0.2330	-0.2164	-0.1977	-0.1802	-0.1514	-0.1297	-0.1131	-0.1001
5.0000	-0.2588	-0.2404	-0.2197	-0.2003	-0.1683	-0.1441	-0.1257	-0.1112
10.0000	-0.3860	-0.3590	-0.3283	-0.2994	-0.2516	-0.2156	-0.1880	-0.1665
15.0000	-0.5074	-0.4724	-0.4323	-0.3945	-0.3317	-0.2843	-0.2480	-0.2197

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.3592	-0.3339	-0.3046	-0.2767	-0.2307	-0.1966	-0.1708	-0.1509
-10.0000	-0.2115	-0.1968	-0.1796	-0.1632	-0.1361	-0.1159	-0.1007	-0.0890
-5.0000	-0.0521	-0.0488	-0.0446	-0.0404	-0.0335	-0.0284	-0.0246	-0.0217
-4.0000	-0.0172	-0.0192	-0.0167	-0.0151	-0.0123	-0.0103	-0.0089	-0.0078
-3.0000	0.0139	0.0125	0.0114	0.0105	0.0091	0.0080	0.0071	0.0062
-2.0000	0.0471	0.0435	0.0396	0.0362	0.0306	0.0263	0.0230	0.0204
-1.0000	0.0836	0.0746	0.0680	0.0620	0.0522	0.0448	0.0391	0.0346
0.	0.1141	0.1058	0.0965	0.0880	0.0739	0.0634	0.0552	0.0489
1.0000	0.1477	0.1370	0.1251	0.1140	0.0957	0.0820	0.0714	0.0632
2.0000	0.1814	0.1683	0.1537	0.1400	0.1175	0.1006	0.0877	0.0775
3.0000	0.2150	0.1996	0.1823	0.1661	0.1394	0.1193	0.1039	0.0919
4.0000	0.2486	0.2309	0.2109	0.1921	0.1612	0.1379	0.1202	0.1063
5.0000	0.2821	0.2621	0.2394	0.2181	0.1829	0.1565	0.1364	0.1206
10.0000	0.4467	0.4154	0.3796	0.3459	0.2902	0.2483	0.2163	0.1914
15.0000	0.6030	0.5611	0.5130	0.4676	0.3924	0.3358	0.2927	0.2590

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.8462	0.6993	0.5661	0.4653	0.3357	0.2600	0.2114	0.1779
-10.0000	0.8617	0.7104	0.5733	0.4699	0.3375	0.2605	0.2113	0.1775
-5.0000	0.8717	0.7247	0.5847	0.4790	0.3439	0.2653	0.2152	0.1807
-4.0000	0.8834	0.7280	0.5874	0.4814	0.3457	0.2668	0.2164	0.1817
-3.0000	0.8872	0.7313	0.5903	0.4839	0.3477	0.2685	0.2178	0.1830
-2.0000	0.8911	0.7347	0.5933	0.4866	0.3498	0.2703	0.2194	0.1843
-1.0000	0.8950	0.7383	0.5965	0.4894	0.3522	0.2722	0.2211	0.1858
0.	0.8990	0.7419	0.5998	0.4924	0.3547	0.2744	0.2229	0.1875
1.0000	0.9030	0.7457	0.6032	0.4956	0.3573	0.2767	0.2249	0.1892
2.0000	0.9070	0.7495	0.6068	0.4989	0.3601	0.2791	0.2271	0.1911
3.0000	0.9111	0.7534	0.6105	0.5023	0.3631	0.2817	0.2294	0.1932
4.0000	0.9152	0.7574	0.6143	0.5059	0.3663	0.2844	0.2318	0.1953
5.0000	0.9193	0.7615	0.6182	0.5096	0.3695	0.2873	0.2344	0.1976
10.0000	0.9397	0.7827	0.6394	0.5301	0.3880	0.3038	0.2491	0.2109
15.0000	0.9603	0.8051	0.6626	0.5533	0.4096	0.3233	0.2667	0.2268

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1406	-0.1858	-0.2361	-0.2818	-0.3541	-0.4060	-0.4439	-0.4728
-10.0000	-0.0662	-0.0960	-0.1298	-0.1611	-0.2119	-0.2490	-0.2770	-0.2987
-5.0000	0.0281	0.0200	0.0111	0.0031	-0.0098	-0.0194	-0.0266	-0.0323
-4.0000	0.0491	0.0448	0.0414	0.0385	0.0343	0.0312	0.0287	0.0269
-3.0000	0.0681	0.0696	0.0718	0.0742	0.0787	0.0823	0.0847	0.0864
-2.0000	0.0879	0.0943	0.1019	0.1096	0.1228	0.1327	0.1403	0.1462
-1.0000	0.1077	0.1187	0.1317	0.1445	0.1661	0.1826	0.1949	0.2043
0.	0.1269	0.1426	0.1609	0.1787	0.2083	0.2310	0.2476	0.2608
1.0000	0.1457	0.1657	0.1893	0.2117	0.2492	0.2775	0.2984	0.3147
2.0000	0.1639	0.1882	0.2165	0.2433	0.2881	0.3215	0.3466	0.3655
3.0000	0.1813	0.2096	0.2424	0.2735	0.3250	0.3630	0.3912	0.4130
4.0000	0.1979	0.2300	0.2670	0.3018	0.3591	0.4013	0.4329	0.4570
5.0000	0.2136	0.2472	0.2899	0.3282	0.3906	0.4364	0.4705	0.4963
10.0000	0.2758	0.3241	0.3778	0.4271	0.5050	0.5602	0.6001	0.6303
15.0000	0.3081	0.3615	0.4193	0.4706	0.5491	0.6029	0.6410	0.6692

(a) $\delta = 50°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.2111	-0.2059	-0.1987	-0.1904	-0.1736	-0.1582	-0.1448	-0.1333
-10.0000	-0.2879	-0.2812	-0.2718	-0.2610	-0.2389	-0.2183	-0.2004	-0.1848
-5.0000	-0.3713	-0.3630	-0.3513	-0.3379	-0.3100	-0.2840	-0.2611	-0.2412
-4.0000	-0.3885	-0.3799	-0.3678	-0.3538	-0.3248	-0.2977	-0.2738	-0.2530
-3.0000	-0.4059	-0.3970	-0.3844	-0.3699	-0.3396	-0.3114	-0.2865	-0.2648
-2.0000	-0.4234	-0.4142	-0.4011	-0.3860	-0.3546	-0.3253	-0.2993	-0.2767
-1.0000	-0.4410	-0.4314	-0.4179	-0.4023	-0.3697	-0.3393	-0.3123	-0.2887
0.	-0.4586	-0.4488	-0.4348	-0.4187	-0.3849	-0.3533	-0.3253	-0.3008
1.0000	-0.4764	-0.4662	-0.4518	-0.4351	-0.4001	-0.3674	-0.3384	-0.3130
2.0000	-0.4941	-0.4836	-0.4687	-0.4515	-0.4154	-0.3815	-0.3515	-0.3252
3.0000	-0.5119	-0.5011	-0.4857	-0.4680	-0.4307	-0.3957	-0.3646	-0.3374
4.0000	-0.5297	-0.5186	-0.5027	-0.4844	-0.4460	-0.4099	-0.3777	-0.3496
5.0000	-0.5474	-0.5360	-0.5197	-0.5039	-0.4613	-0.4240	-0.3909	-0.3618
10.0000	-0.6348	-0.6219	-0.6034	-0.5820	-0.5368	-0.4940	-0.4559	-0.4223
15.0000	-0.7182	-0.7039	-0.6835	-0.6596	-0.6092	-0.5612	-0.5183	-0.4805

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2609	0.2523	0.2407	0.2280	0.2035	0.1822	0.1643	0.1495
-10.0000	0.3688	0.3573	0.3417	0.3246	0.2909	0.2613	0.2364	0.2154
-5.0000	0.4852	0.4707	0.4509	0.4290	0.3857	0.3474	0.3149	0.2874
-4.0000	0.5092	0.4941	0.4734	0.4506	0.4053	0.3652	0.3311	0.3024
-3.0000	0.5333	0.5176	0.4961	0.4723	0.4251	0.3832	0.3475	0.3174
-2.0000	0.5576	0.5413	0.5189	0.4942	0.4450	0.4013	0.3641	0.3326
-1.0000	0.5820	0.5651	0.5419	0.5161	0.4650	0.4195	0.3807	0.3479
0.	0.6064	0.5889	0.5649	0.5382	0.4851	0.4378	0.3974	0.3632
1.0000	0.6309	0.6128	0.5880	0.5603	0.5053	0.4561	0.4142	0.3787
2.0000	0.6555	0.6368	0.6111	0.5825	0.5255	0.4745	0.4310	0.3941
3.0000	0.6800	0.6607	0.6342	0.6046	0.5457	0.4929	0.4479	0.4096
4.0000	0.7045	0.6846	0.6573	0.6268	0.5659	0.5113	0.4647	0.4251
5.0000	0.7289	0.7084	0.6803	0.6489	0.5860	0.5297	0.4815	0.4406
10.0000	0.8488	0.8526	0.7935	0.7576	0.6854	0.6204	0.5646	0.5171
15.0000	0.9625	0.9368	0.9012	0.8611	0.7803	0.7072	0.6442	0.5904

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.4949	0.4543	0.4077	0.3648	0.2976	0.2505	0.2163	0.1906
-10.0000	0.5945	0.5499	0.4981	0.4498	0.3728	0.3174	0.2766	0.2452
-5.0000	0.6990	0.6506	0.5939	0.5405	0.4536	0.3898	0.3419	0.3047
-4.0000	0.7202	0.6711	0.6135	0.5590	0.4702	0.4047	0.3554	0.3171
-3.0000	0.7414	0.6916	0.6331	0.5777	0.4869	0.4198	0.3690	0.3295
-2.0000	0.7626	0.7122	0.6528	0.5964	0.5037	0.4349	0.3828	0.3420
-1.0000	0.7839	0.7328	0.6725	0.6151	0.5206	0.4501	0.3966	0.3546
0.	0.8051	0.7534	0.6923	0.6339	0.5375	0.4654	0.4104	0.3673
1.0000	0.8262	0.7739	0.7120	0.6527	0.5545	0.4807	0.4243	0.3800
2.0000	0.8473	0.7944	0.7316	0.6715	0.5714	0.4960	0.4382	0.3927
3.0000	0.8682	0.8148	0.7512	0.6902	0.5883	0.5113	0.4521	0.4054
4.0000	0.8890	0.8350	0.7707	0.7088	0.6052	0.5266	0.4661	0.4182
5.0000	0.9096	0.8551	0.7901	0.7274	0.6221	0.5419	0.4799	0.4309
10.0000	1.0094	0.9527	0.8845	0.8180	0.7046	0.6169	0.5484	0.4937
15.0000	1.1014	1.0432	0.9726	0.9030	0.7827	0.6883	0.6138	0.5538

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.9259	0.9672	1.0196	1.0726	1.1653	1.2362	1.2901	1.3323
-10.0000	0.8945	0.9330	0.9810	1.0289	1.1093	1.1693	1.2139	1.2481
-5.0000	0.8322	0.8658	0.9069	0.9470	1.0132	1.0615	1.0969	1.1234
-4.0000	0.8174	0.8499	0.8896	0.9283	0.9917	1.0378	1.0713	1.0967
-3.0000	0.8020	0.8335	0.8718	0.9089	0.9699	1.0137	1.0458	1.0697
-2.0000	0.7862	0.8166	0.8535	0.8893	0.9476	0.9895	1.0199	1.0429
-1.0000	0.7699	0.7994	0.8350	0.8692	0.9251	0.9652	0.9940	1.0160
0.	0.7532	0.7817	0.8160	0.8490	0.9025	0.9407	0.9683	0.9888
1.0000	0.7363	0.7638	0.7969	0.8286	0.8798	0.9162	0.9427	0.9624
2.0000	0.7193	0.7458	0.7777	0.8081	0.8572	0.8919	0.9171	0.9358
3.0000	0.7020	0.7275	0.7583	0.7874	0.8346	0.8678	0.8920	0.9098
4.0000	0.6846	0.7093	0.7389	0.7670	0.8120	0.8437	0.8666	0.8838
5.0000	0.6671	0.6909	0.7194	0.7463	0.7894	0.8199	0.8419	0.8582
10.0000	0.5788	0.6007	0.6223	0.6446	0.6798	0.7044	0.7221	0.7353
15.0000	0.4910	0.5079	0.5276	0.5461	0.5753	0.5956	0.6100	0.6208

TABLE V.- CONTINUED

(b) δ= 60°

C_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1739	-0.1683	-0.1603	-0.1513	-0.1336	-0.1183	-0.1058	-0.0954
-10.0000	-0.2514	-0.2432	-0.2318	-0.2190	-0.1939	-0.1724	-0.1545	-0.1397
-5.0000	-0.3347	-0.3239	-0.3088	-0.2920	-0.2592	-0.2309	-0.2074	-0.1879
-4.0000	-0.3518	-0.3404	-0.3246	-0.3071	-0.2727	-0.2431	-0.2184	-0.1978
-3.0000	-0.3690	-0.3571	-0.3406	-0.3222	-0.2863	-0.2553	-0.2294	-0.2079
-2.0000	-0.3864	-0.3739	-0.3567	-0.3375	-0.3000	-0.2676	-0.2406	-0.2181
-1.0000	-0.4038	-0.3908	-0.3728	-0.3528	-0.3137	-0.2799	-0.2517	-0.2283
0.	-0.4212	-0.4077	-0.3890	-0.3682	-0.3275	-0.2924	-0.2630	-0.2385
1.0000	-0.4386	-0.4246	-0.4052	-0.3836	-0.3414	-0.3048	-0.2743	-0.2488
2.0000	-0.4561	-0.4415	-0.4214	-0.3990	-0.3552	-0.3173	-0.2856	-0.2591
3.0000	-0.4735	-0.4585	-0.4376	-0.4144	-0.3691	-0.3298	-0.2969	-0.2694
4.0000	-0.4910	-0.4753	-0.4537	-0.4298	-0.3829	-0.3422	-0.3082	-0.2798
5.0000	-0.5083	-0.4922	-0.4699	-0.4451	-0.3967	-0.3547	-0.3195	-0.2901
10.0000	-0.5934	-0.5747	-0.5490	-0.5205	-0.4647	-0.4161	-0.3753	-0.3410
15.0000	-0.6738	-0.6529	-0.6241	-0.5921	-0.5294	-0.4746	-0.4285	-0.3898

C_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1393	0.1351	0.1289	0.1216	0.1069	0.0941	0.0835	0.0749
-10.0000	0.2479	0.2396	0.2279	0.2147	0.1887	0.1664	0.1481	0.1332
-5.0000	0.3643	0.3517	0.3342	0.3147	0.2769	0.2446	0.2181	0.1963
-4.0000	0.3881	0.3747	0.3560	0.3353	0.2950	0.2607	0.2325	0.2094
-3.0000	0.4122	0.3978	0.3780	0.3560	0.3133	0.2770	0.2470	0.2225
-2.0000	0.4363	0.4211	0.4001	0.3768	0.3317	0.2933	0.2617	0.2357
-1.0000	0.4605	0.4444	0.4222	0.3977	0.3502	0.3097	0.2764	0.2490
0.	0.4848	0.4678	0.4445	0.4187	0.3687	0.3261	0.2912	0.2624
1.0000	0.5090	0.4912	0.4667	0.4396	0.3873	0.3427	0.3060	0.2758
2.0000	0.5333	0.5146	0.4890	0.4606	0.4059	0.3592	0.3208	0.2892
3.0000	0.5575	0.5380	0.5112	0.4816	0.4245	0.3757	0.3356	0.3027
4.0000	0.5817	0.5613	0.5333	0.5025	0.4430	0.3922	0.3504	0.3161
5.0000	0.6058	0.5845	0.5554	0.5234	0.4615	0.4087	0.3652	0.3295
10.0000	0.7236	0.6983	0.6637	0.6256	0.5523	0.4896	0.4380	0.3954
15.0000	0.8347	0.8056	0.7659	0.7224	0.6384	0.5666	0.5073	0.4583

C_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.7304	0.6578	0.5746	0.4989	0.3843	0.3085	0.2567	0.2194
-10.0000	0.8179	0.7415	0.6511	0.5693	0.4440	0.3600	0.3018	0.2595
-5.0000	0.9063	0.8246	0.7298	0.6424	0.5070	0.4149	0.3503	0.3029
-4.0000	0.9238	0.8414	0.7456	0.6571	0.5198	0.4261	0.3603	0.3119
-3.0000	0.9412	0.8581	0.7614	0.6719	0.5327	0.4374	0.3703	0.3209
-2.0000	0.9585	0.8747	0.7771	0.6866	0.5456	0.4488	0.3804	0.3300
-1.0000	0.9757	0.8912	0.7927	0.7013	0.5585	0.4601	0.3905	0.3391
0.	0.9927	0.9076	0.8083	0.7159	0.5713	0.4715	0.4007	0.3482
1.0000	1.0095	0.9239	0.8238	0.7305	0.5842	0.4829	0.4109	0.3574
2.0000	1.0262	0.9400	0.8391	0.7450	0.5970	0.4943	0.4210	0.3666
3.0000	1.0426	0.9559	0.8543	0.7594	0.6098	0.5056	0.4312	0.3758
4.0000	1.0587	0.9716	0.8693	0.7736	0.6225	0.5167	0.4413	0.3849
5.0000	1.0746	0.9871	0.8842	0.7878	0.6351	0.5282	0.4514	0.3941
10.0000	1.1496	1.0605	0.9552	0.8557	0.6963	0.5831	0.5010	0.4390
15.0000	1.2152	1.1257	1.0191	0.9175	0.7530	0.6347	0.5478	0.4818

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.4834	0.5009	0.5238	0.5474	0.5901	0.6240	0.6499	0.6707
-10.0000	0.5065	0.5301	0.5610	0.5929	0.6500	0.6952	0.7302	0.7582
-5.0000	0.5073	0.5339	0.5682	0.6032	0.6654	0.7138	0.7510	0.7798
-4.0000	0.5049	0.5318	0.5663	0.6017	0.6638	0.7122	0.7490	0.7778
-3.0000	0.5019	0.5288	0.5635	0.5989	0.6609	0.7090	0.7455	0.7739
-2.0000	0.4980	0.5252	0.5598	0.5951	0.6568	0.7045	0.7407	0.7683
-1.0000	0.4935	0.5206	0.5552	0.5904	0.6516	0.6988	0.7343	0.7615
0.	0.4884	0.5154	0.5499	0.5849	0.6454	0.6916	0.7267	0.7536
1.0000	0.4825	0.5095	0.5437	0.5783	0.6381	0.6837	0.7179	0.7442
2.0000	0.4761	0.5029	0.5369	0.5710	0.6300	0.6746	0.7082	0.7337
3.0000	0.4692	0.4958	0.5294	0.5631	0.6211	0.6648	0.6974	0.7226
4.0000	0.4618	0.4881	0.5212	0.5544	0.6113	0.6541	0.6860	0.7105
5.0000	0.4539	0.4798	0.5125	0.5452	0.6010	0.6428	0.6739	0.6976
10.0000	0.4078	0.4320	0.4619	0.4914	0.5412	0.5778	0.6047	0.6251
15.0000	0.3538	0.3757	0.4025	0.4289	0.4725	0.5042	0.5273	0.5445

TABLE V.- CONTINUED

(c) $\delta = 70°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0774	-0.0745	-0.0706	-0.0663	-0.0580	-0.0510	-0.0452	-0.0404
-10.0000	-0.1541	-0.1481	-0.1400	-0.1312	-0.1147	-0.1008	-0.0895	-0.0802
-5.0000	-0.2362	-0.2268	-0.2143	-0.2009	-0.1757	-0.1546	-0.1374	-0.1233
-4.0000	-0.2530	-0.2430	-0.2296	-0.2153	-0.1883	-0.1657	-0.1472	-0.1322
-3.0000	-0.2699	-0.2592	-0.2450	-0.2297	-0.2009	-0.1768	-0.1572	-0.1411
-2.0000	-0.2869	-0.2755	-0.2604	-0.2442	-0.2136	-0.1881	-0.1672	-0.1501
-1.0000	-0.3039	-0.2919	-0.2759	-0.2587	-0.2264	-0.1993	-0.1773	-0.1592
0.	-0.3210	-0.3083	-0.2914	-0.2733	-0.2392	-0.2106	-0.1874	-0.1683
1.0000	-0.3380	-0.3247	-0.3069	-0.2878	-0.2520	-0.2220	-0.1975	-0.1774
2.0000	-0.3551	-0.3411	-0.3224	-0.3024	-0.2648	-0.2333	-0.2076	-0.1865
3.0000	-0.3721	-0.3574	-0.3379	-0.3170	-0.2776	-0.2447	-0.2177	-0.1957
4.0000	-0.3890	-0.3737	-0.3534	-0.3315	-0.2904	-0.2560	-0.2279	-0.2048
5.0000	-0.4059	-0.3900	-0.3688	-0.3460	-0.3032	-0.2673	-0.2379	-0.2139
10.0000	-0.4885	-0.4695	-0.4441	-0.4169	-0.3658	-0.3228	-0.2876	-0.2587
15.0000	-0.5661	-0.5443	-0.5152	-0.4839	-0.4250	-0.3754	-0.3348	-0.3014

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0109	-0.0097	-0.0083	-0.0071	-0.0053	-0.0043	-0.0037	-0.0033
-10.0000	0.0991	0.0956	0.0907	0.0852	0.0747	0.0657	0.0582	0.0521
-5.0000	0.2166	0.2080	0.1965	0.1841	0.1606	0.1409	0.1249	0.1118
-4.0000	0.2406	0.2311	0.2182	0.2043	0.1782	0.1563	0.1386	0.1241
-3.0000	0.2648	0.2542	0.2400	0.2247	0.1960	0.1719	0.1524	0.1365
-2.0000	0.2891	0.2775	0.2619	0.2452	0.2138	0.1876	0.1663	0.1489
-1.0000	0.3134	0.3008	0.2839	0.2658	0.2317	0.2033	0.1802	0.1614
0.	0.3378	0.3242	0.3059	0.2864	0.2497	0.2190	0.1942	0.1740
1.0000	0.3622	0.3475	0.3280	0.3070	0.2676	0.2348	0.2082	0.1865
2.0000	0.3866	0.3709	0.3500	0.3276	0.2856	0.2506	0.2222	0.1991
3.0000	0.4109	0.3942	0.3720	0.3482	0.3035	0.2664	0.2362	0.2117
4.0000	0.4351	0.4174	0.3939	0.3687	0.3214	0.2821	0.2502	0.2242
5.0000	0.4592	0.4406	0.4157	0.3891	0.3393	0.2978	0.2641	0.2367
10.0000	0.5771	0.5536	0.5224	0.4891	0.4267	0.3747	0.3325	0.2982
15.0000	0.6878	0.6599	0.6229	0.5833	0.5092	0.4474	0.3973	0.3565

c_A

α, deg \ m	.25	.50	75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.9273	0.8312	0.7210	0.6210	0.4706	0.3725	0.3062	0.2592
-10.0000	0.9964	0.8952	0.7789	0.6731	0.5133	0.4083	0.3370	0.2861
-5.0000	1.0629	0.9576	0.8363	0.7255	0.5573	0.4459	0.3697	0.3151
-4.0000	1.0757	0.9697	0.8475	0.7359	0.5661	0.4535	0.3764	0.3210
-3.0000	1.0883	0.9817	0.8587	0.7462	0.5749	0.4612	0.3832	0.3270
-2.0000	1.1007	0.9935	0.8697	0.7564	0.5838	0.4689	0.3899	0.3331
-1.0000	1.1128	1.0051	0.8806	0.7666	0.5925	0.4765	0.3967	0.3391
0.	1.1248	1.0165	0.8914	0.7766	0.6013	0.4842	0.4035	0.3452
1.0000	1.1364	1.0277	0.9020	0.7866	0.6100	0.4918	0.4102	0.3513
2.0000	1.1478	1.0387	0.9124	0.7964	0.6186	0.4994	0.4170	0.3573
3.0000	1.1589	1.0494	0.9226	0.8060	0.6271	0.5070	0.4238	0.3634
4.0000	1.1697	1.0599	0.9327	0.8156	0.6356	0.5145	0.4305	0.3695
5.0000	1.1802	1.0702	0.9425	0.8249	0.6440	0.5220	0.4372	0.3755
10.0000	1.2275	1.1169	0.9882	0.8689	0.6841	0.5581	0.4698	0.4051
15.0000	1.2652	1.1554	1.0269	0.9073	0.7203	0.5915	0.5004	0.4331

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2554	0.2555	0.2556	0.2557	0.2559	0.2556	0.2550	0.2544
-10.0000	0.2807	0.2860	0.2989	0.3098	0.3303	0.3471	0.3600	0.3703
-5.0000	0.2966	0.3106	0.3292	0.3490	0.3854	0.4150	0.4383	0.4565
-4.0000	0.2983	0.3135	0.3334	0.3544	0.3934	0.4248	0.4497	0.4692
-3.0000	0.2995	0.3156	0.3368	0.3592	0.4005	0.4336	0.4597	0.4803
-2.0000	0.3003	0.3173	0.3396	0.3632	0.4063	0.4412	0.4684	0.4896
-1.0000	0.3006	0.3184	0.3418	0.3664	0.4113	0.4474	0.4755	0.4976
0.	0.3003	0.3199	0.3432	0.3688	0.4153	0.4523	0.4813	0.5041
1.0000	0.2996	0.3188	0.3440	0.3703	0.4180	0.4562	0.4858	0.5087
2.0000	0.2984	0.3182	0.3441	0.3711	0.4200	0.4588	0.4888	0.5123
3.0000	0.2966	0.3170	0.3435	0.3712	0.4209	0.4604	0.4906	0.5144
4.0000	0.2944	0.3152	0.3423	0.3704	0.4209	0.4607	0.4913	0.5150
5.0000	0.2917	0.3129	0.3404	0.3690	0.4200	0.4600	0.4907	0.5145
10.0000	0.2713	0.2937	0.3223	0.3517	0.4031	0.4427	0.4725	0.4955
15.0000	0.2406	0.2630	0.2913	0.3198	0.3691	0.4061	0.4337	0.4549

TABLE V.- CONCLUDED

(d) δ = 80°

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.0663	0.0633	0.0594	0.0551	0.0472	0.0408	0.0359	0.0320
-10.0000	-0.0094	-0.0090	-0.0085	-0.0081	-0.0074	-0.0067	-0.0060	-0.0054
-5.0000	-0.0901	-0.0861	-0.0809	-0.0756	-0.0658	-0.0577	-0.0510	-0.0456
-4.0000	-0.1066	-0.1019	-0.0958	-0.0894	-0.0778	-0.0681	-0.0603	-0.0539
-3.0000	-0.1232	-0.1178	-0.1107	-0.1034	-0.0898	-0.0786	-0.0696	-0.0622
-2.0000	-0.1399	-0.1337	-0.1257	-0.1173	-0.1019	-0.0892	-0.0789	-0.0706
-1.0000	-0.1566	-0.1497	-0.1407	-0.1314	-0.1141	-0.0998	-0.0883	-0.0790
0.	-0.1733	-0.1657	-0.1558	-0.1454	-0.1263	-0.1105	-0.0977	-0.0874
1.0000	-0.1900	-0.1817	-0.1708	-0.1594	-0.1385	-0.1211	-0.1071	-0.0958
2.0000	-0.2067	-0.1977	-0.1859	-0.1735	-0.1506	-0.1318	-0.1166	-0.1042
3.0000	-0.2234	-0.2136	-0.2009	-0.1875	-0.1628	-0.1424	-0.1260	-0.1126
4.0000	-0.2400	-0.2295	-0.2159	-0.2015	-0.1749	-0.1530	-0.1354	-0.1210
5.0000	-0.2565	-0.2453	-0.2307	-0.2154	-0.1870	-0.1636	-0.1447	-0.1294
10.0000	-0.3372	-0.3227	-0.3036	-0.2834	-0.2462	-0.2154	-0.1906	-0.1704
15.0000	-0.4130	-0.3953	-0.3720	-0.3474	-0.3019	-0.2643	-0.2339	-0.2093

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1773	-0.1693	-0.1588	-0.1475	-0.1269	-0.1101	-0.0969	-0.0864
-10.0000	-0.0664	-0.0635	-0.0595	-0.0552	-0.0472	-0.0408	-0.0358	-0.0319
-5.0000	0.0517	0.0494	0.0465	0.0435	0.0380	0.0334	0.0297	0.0265
-4.0000	0.0758	0.0725	0.0682	0.0637	0.0555	0.0487	0.0431	0.0385
-3.0000	0.1001	0.0957	0.0900	0.0840	0.0731	0.0640	0.0566	0.0506
-2.0000	0.1245	0.1190	0.1119	0.1044	0.0907	0.0794	0.0702	0.0627
-1.0000	0.1490	0.1424	0.1339	0.1249	0.1084	0.0948	0.0838	0.0749
0.	0.1735	0.1658	0.1558	0.1454	0.1262	0.1103	0.0975	0.0871
1.0000	0.1979	0.1892	0.1778	0.1659	0.1439	0.1258	0.1111	0.0993
2.0000	0.2224	0.2126	0.1998	0.1864	0.1616	0.1412	0.1248	0.1115
3.0000	0.2468	0.2359	0.2217	0.2068	0.1793	0.1567	0.1384	0.1237
4.0000	0.2711	0.2592	0.2436	0.2272	0.1970	0.1721	0.1520	0.1358
5.0000	0.2953	0.2823	0.2653	0.2475	0.2145	0.1874	0.1656	0.1479
10.0000	0.4134	0.3953	0.3716	0.3466	0.3004	0.2624	0.2319	0.2072
15.0000	0.5242	0.5014	0.4715	0.4398	0.3813	0.3331	0.2944	0.2631

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	1.0846	0.9718	0.8429	0.7260	0.5502	0.4353	0.3576	0.3025
-10.0000	1.1305	1.0132	0.8790	0.7573	0.5743	0.4546	0.3736	0.3161
-5.0000	1.1711	1.0504	0.9122	0.7869	0.5981	0.4743	0.3904	0.3307
-4.0000	1.1785	1.0572	0.9185	0.7925	0.6027	0.4783	0.3938	0.3337
-3.0000	1.1855	1.0639	0.9245	0.7980	0.6074	0.4822	0.3972	0.3367
-2.0000	1.1923	1.0702	0.9304	0.8034	0.6119	0.4861	0.4006	0.3397
-1.0000	1.1988	1.0764	0.9361	0.8087	0.6164	0.4900	0.4040	0.3427
0.	1.2051	1.0823	0.9417	0.8138	0.6209	0.4938	0.4074	0.3458
1.0000	1.2110	1.0880	0.9470	0.8188	0.6252	0.4977	0.4108	0.3488
2.0000	1.2165	1.0934	0.9522	0.8237	0.6295	0.5015	0.4142	0.3518
3.0000	1.2218	1.0985	0.9571	0.8284	0.6337	0.5052	0.4176	0.3549
4.0000	1.2267	1.1034	0.9618	0.8330	0.6379	0.5089	0.4209	0.3579
5.0000	1.2313	1.1080	0.9664	0.8373	0.6419	0.5126	0.4242	0.3609
10.0000	1.2492	1.1266	0.9856	0.8567	0.6606	0.5300	0.4403	0.3757
15.0000	1.2581	1.1376	0.9987	0.8713	0.6764	0.5456	0.4551	0.3896

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1001	0.0896	0.0757	0.0614	0.0351	0.0141	-0.0028	-0.0164
-10.0000	0.1164	0.1124	0.1074	0.1021	0.0928	0.0852	0.0792	0.0741
-5.0000	0.1321	0.1351	0.1391	0.1435	0.1519	0.1589	0.1647	0.1688
-4.0000	0.1349	0.1392	0.1449	0.1512	0.1631	0.1730	0.1808	0.1868
-3.0000	0.1375	0.1430	0.1505	0.1585	0.1739	0.1864	0.1964	0.2043
-2.0000	0.1399	0.1467	0.1558	0.1656	0.1841	0.1994	0.2115	0.2209
-1.0000	0.1421	0.1501	0.1609	0.1724	0.1939	0.2116	0.2257	0.2369
0.	0.1440	0.1532	0.1654	0.1787	0.2033	0.2234	0.2393	0.2519
1.0000	0.1455	0.1560	0.1697	0.1845	0.2119	0.2343	0.2518	0.2659
2.0000	0.1470	0.1584	0.1736	0.1899	0.2198	0.2442	0.2636	0.2789
3.0000	0.1480	0.1605	0.1771	0.1947	0.2272	0.2536	0.2742	0.2908
4.0000	0.1488	0.1623	0.1802	0.1990	0.2338	0.2621	0.2840	0.3015
5.0000	0.1492	0.1636	0.1826	0.2029	0.2397	0.2695	0.2929	0.3112
10.0000	0.1461	0.1644	0.1882	0.2131	0.2577	0.2932	0.3206	0.3419
15.0000	0.1338	0.1546	0.1812	0.2086	0.2570	0.2944	0.3230	0.3449

TABLE VI.- LONGITUDINAL AERODYNAMICS OF RAKED-OFF ELLIPTICAL CONES $\theta_{xz} = 50°$

(a) $\delta = 60°$

c_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.3236	-0.3188	-0.3116	-0.3027	-0.2828	-.2627	-0.2446	-0.2273
-10.0000	-0.4037	-0.3950	-0.3862	-0.3755	-0.3513	-0.3269	-0.3041	-0.2835
-5.0000	-0.4791	-0.4724	-0.4622	-0.4497	-0.4213	-.3924	-0.3655	-0.3411
-4.0000	-0.4948	-0.4878	-0.4774	-0.4644	-0.4352	-.4055	-0.3778	-0.3526
-3.0000	-0.5103	-0.5032	-0.4924	-0.4792	-0.4491	-.4186	-0.3900	-0.3641
-2.0000	-0.5258	-0.5185	-0.5075	-0.4938	-0.4630	-.4316	-0.4022	-0.3755
-1.0000	-0.5412	-0.5337	-0.5224	-0.5084	-0.4767	-.4445	-0.4143	-0.3869
0.	-0.5565	-0.5488	-0.5372	-0.5229	-0.4904	-.4574	-0.4263	-0.3982
1.0000	-0.5716	-0.5638	-0.5519	-0.5372	-0.5040	-.4701	-0.4383	-0.4094
2.0000	-0.5866	-0.5786	-0.5664	-0.5514	-0.5174	-.4827	-0.4501	-0.4205
3.0000	-0.6014	-0.5932	-0.5808	-0.5655	-0.5307	-.4952	-0.4618	-0.4315
4.0000	-0.6160	-0.6076	-0.5950	-0.5793	-0.5438	-.5075	-0.4734	-0.4424
5.0000	-0.6304	-0.6219	-0.6089	-0.5930	-0.5567	-.5196	-0.4848	-0.4531
10.0000	-0.6986	-0.6893	-0.6752	-0.6578	-0.6181	-.5774	-0.5391	-0.5041
15.0000	-0.7591	-0.7492	-0.7341	-0.7154	-0.6727	-.6280	-0.5875	-0.5497

c_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3586	0.3518	0.3417	0.3296	0.3034	.2779	0.2551	0.2349
-10.0000	0.4530	0.4446	0.4322	0.4173	0.3847	.3530	0.3243	0.2992
-5.0000	0.5489	0.5390	0.5247	0.5065	0.4676	.4297	0.3953	0.3650
-4.0000	0.5680	0.5578	0.5426	0.5243	0.4842	.4450	0.4095	0.3781
-3.0000	0.5870	0.5765	0.5609	0.5420	0.5007	.4603	0.4236	0.3912
-2.0000	0.6059	0.5951	0.5790	0.5597	0.5171	.4755	0.4377	0.4043
-1.0000	0.6247	0.6136	0.5971	0.5772	0.5335	.4906	0.4517	0.4173
0.	0.6434	0.6320	0.6151	0.5946	0.5497	.5056	0.4656	0.4303
1.0000	0.6619	0.6502	0.6328	0.6119	0.5658	.5205	0.4794	0.4431
2.0000	0.6832	0.6682	0.6504	0.6289	0.5817	.5353	0.4931	0.4558
3.0000	0.6983	0.6860	0.6678	0.6458	0.5974	.5499	0.5067	0.4684
4.0000	0.7161	0.7036	0.6850	0.6625	0.6130	.5643	0.5201	0.4808
5.0000	0.7337	0.7209	0.7019	0.6789	0.6283	.5786	0.5332	0.4931
10.0000	0.8170	0.8031	0.7821	0.7569	0.7012	.6462	0.5961	0.5516
15.0000	0.8908	0.8758	0.8533	0.8261	0.7660	.7066	0.6522	0.6039

c_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.8180	0.7832	0.7362	0.6855	0.5911	.5143	0.4537	0.4055
-10.0000	0.9436	0.9058	0.8544	0.7986	0.6930	.6176	0.5387	0.4834
-5.0000	1.0666	1.0261	0.9708	0.9105	0.7962	.7209	0.6241	0.5619
-4.0000	1.0906	1.0496	0.9936	0.9324	0.8163	.7193	0.6411	0.5775
-3.0000	1.1142	1.0728	1.0161	0.9541	0.8363	.7376	0.6578	0.5930
-2.0000	1.1376	1.0957	1.0384	0.9756	0.8560	.7557	0.6744	0.6083
-1.0000	1.1606	1.1183	1.0603	0.9968	0.8756	.7737	0.6909	0.6236
0.	1.1833	1.1406	1.0820	1.0177	0.8949	.7914	0.7073	0.6387
1.0000	1.2056	1.1624	1.1033	1.0383	0.9140	.8090	0.7234	0.6536
2.0000	1.2274	1.1839	1.1242	1.0586	0.9327	.8263	0.7394	0.6684
3.0000	1.2488	1.2049	1.1447	1.0785	0.9512	.8433	0.7551	0.6829
4.0000	1.2697	1.2255	1.1648	1.0979	0.9693	.8600	0.7706	0.6973
5.0000	1.2901	1.2456	1.1845	1.1170	0.9871	.8765	0.7859	0.7114
10.0000	1.3837	1.3381	1.2751	1.2054	1.0699	.9534	0.8572	0.7777
15.0000	1.4614	1.4153	1.3513	1.2801	1.1408	1.0200	0.9193	0.8358

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.8003	0.8153	0.8361	0.8595	0.9058	.9451	0.9772	1.0029
-10.0000	0.7171	0.7304	0.7490	0.7698	0.8099	.8437	0.8709	0.8927
-5.0000	0.6305	0.6423	0.6586	0.6767	0.7113	.7403	0.7632	0.7815
-4.0000	0.6131	0.6246	0.6405	0.6581	0.6918	.7197	0.7417	0.7594
-3.0000	0.5957	0.6069	0.6224	0.6395	0.6722	.6993	0.7207	0.7376
-2.0000	0.5783	0.5892	0.6043	0.6211	0.6528	.6791	0.6998	0.7162
-1.0000	0.5610	0.5716	0.5864	0.6026	0.6335	.6588	0.6790	0.6947
0.	0.5437	0.5541	0.5685	0.5843	0.6143	.6387	0.6583	0.6737
1.0000	0.5265	0.5367	0.5506	0.5661	0.5952	.6170	0.6379	0.6528
2.0000	0.5094	0.5193	0.5329	0.5478	0.5762	.5993	0.6176	0.6320
3.0000	0.4923	0.5020	0.5152	0.5298	0.5573	.5799	0.5976	0.6115
4.0000	0.4753	0.4847	0.4977	0.5119	0.5387	.5605	0.5776	0.5911
5.0000	0.4584	0.4676	0.4802	0.4940	0.5201	.5414	0.5577	0.5710
10.0000	0.3751	0.3833	0.3944	0.4066	0.4294	.4479	0.4624	0.4737
15.0000	0.2936	0.3010	0.3109	0.3218	0.3420	.3583	0.3710	0.3809

TABLE VI.- CONTINUED

(b) δ= 70°

c_m

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.000	-.2252	-0.2214	-0.2142	-0.2057	-0.1872	-0.1697	-0.1542	-0.1408
-10.000	-0.2923	-0.2861	-0.2770	-0.2660	-0.2424	-0.2203	-0.2002	-0.1830
-5.000	-0.3505	-0.3523	-0.3438	-0.3274	-0.2987	-0.2714	-0.2472	-0.2262
-4.000	-0.3729	-0.3651	-0.3535	-0.3337	-0.3099	-0.2817	-0.2566	-0.2349
-3.000	-0.3862	-0.3791	-0.3662	-0.3519	-0.3211	-0.2919	-0.2660	-0.2435
-2.000	-0.3935	-0.3912	-0.3798	-0.3640	-0.3323	-0.3021	-0.2753	-0.2521
-1.000	-0.4127	-0.4041	-0.3913	-0.3761	-0.3434	-0.3122	-0.2846	-0.2607
0.	-0.4256	-0.4169	-0.4038	-0.3881	-0.3544	-0.3223	-0.2937	-0.2692
1.000	-0.4397	-0.4236	-0.4161	-0.4003	-0.3653	-0.3323	-0.3031	-0.2776
2.000	-0.4516	-0.4422	-0.4283	-0.4117	-0.3761	-0.3422	-0.3121	-0.2860
3.000	-0.4642	-0.4546	-0.4404	-0.4234	-0.3868	-0.3525	-0.3211	-0.2942
4.000	-0.4758	-0.4667	-0.4523	-0.4349	-0.3974	-0.3617	-0.3303	-0.3024
5.000	-0.4901	-0.4790	-0.4640	-0.4462	-0.4078	-0.3712	-0.3387	-0.3105
10.000	-0.5475	-0.5363	-0.5197	-0.4999	-0.4573	-0.4166	-0.3805	-0.3490
15.000	-0.5993	-0.5871	-0.5691	-0.5476	-0.5013	-0.4572	-0.4178	-0.3834

c_N

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.000	0.1896	0.1856	0.1736	0.1722	0.1563	0.1411	0.1276	0.1161
-10.000	0.2749	0.2689	0.2597	0.2492	0.2261	0.2041	0.1849	0.1683
-5.000	0.3622	0.3542	0.3423	0.3282	0.2978	0.2690	0.2437	0.2220
-4.000	0.3777	0.3713	0.3588	0.3440	0.3121	0.2823	0.2556	0.2328
-3.000	0.3971	0.3883	0.3753	0.3598	0.3265	0.2950	0.2674	0.2436
-2.000	0.4145	0.4053	0.3917	0.3755	0.3408	0.3085	0.2791	0.2544
-1.000	0.4314	0.4222	0.4080	0.3912	0.3550	0.3209	0.2909	0.2651
0.	0.4431	0.4337	0.4243	0.4067	0.3692	0.3337	0.3026	0.2758
1.000	0.4664	0.4557	0.4434	0.4222	0.3832	0.3465	0.3141	0.2864
2.000	0.4820	0.4722	0.4564	0.4375	0.3972	0.3591	0.3257	0.2969
3.000	0.4937	0.4886	0.4722	0.4527	0.4110	0.3716	0.3371	0.3073
4.000	0.5162	0.5048	0.4978	0.4677	0.4246	0.3840	0.3483	0.3177
5.000	0.5326	0.5207	0.5033	0.4825	0.4381	0.3963	0.3595	0.3279
10.000	0.6104	0.5969	0.5769	0.5532	0.5026	0.4548	0.4128	0.3767
15.000	0.6802	0.6652	0.6430	0.6167	0.5605	0.5076	0.4600	0.4208

c_A

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.000	1.0774	1.0189	1.0339	.8557	0.7737	.5861	0.4292	0.4316
-10.000	1.1806	1.1191	1.1343	1.3442	0.7811	0.6541	0.5584	0.4856
-5.000	1.2756	1.2113	1.1221	1.0276	0.8550	0.7106	0.6170	0.5384
-4.000	1.2935	1.2277	1.1388	1.0434	0.8691	0.7323	0.6294	0.5487
-3.000	1.3110	1.2446	1.1550	1.0583	0.8830	0.7447	0.6370	0.5589
-2.000	1.3278	1.2611	1.1700	1.0740	0.8966	0.7560	0.6576	0.5689
-1.000	1.3442	1.2772	1.1864	1.0898	0.9103	0.7690	0.6615	0.5788
0.	1.3602	1.2928	1.2014	1.1032	0.9230	0.7737	0.6721	0.5885
1.000	1.3756	1.3078	1.2160	1.1172	0.9358	0.7922	0.6826	0.5980
2.000	1.3905	1.3224	1.2301	1.1368	0.9482	0.8235	0.6928	0.6074
3.000	1.4047	1.3364	1.2437	1.1439	0.9602	0.8145	0.7020	0.6165
4.000	1.4195	1.3490	1.2560	1.1566	0.9710	0.8252	0.7126	0.6255
5.000	1.4315	1.3628	1.2695	1.1698	0.9832	0.8355	0.7221	0.6342
10.000	1.4575	1.4190	1.3243	1.2225	1.0337	0.8824	0.7654	0.6743
15.000	1.5264	1.4578	1.3641	1.2624	1.0729	0.9198	0.8007	0.7074

L/D

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.000	0.4650	0.4732	0.4838	0.4959	0.5211	0.5439	0.5627	0.5787
-10.000	0.4057	0.4353	0.4475	0.4617	0.4908	0.5169	0.5387	0.5569
-5.000	0.3909	0.3901	0.4033	0.4196	0.4495	0.4769	0.4997	0.5185
-4.000	0.3711	0.3804	0.3937	0.4090	0.4401	0.4676	0.4906	0.5093
-3.000	0.3611	0.3705	0.3839	0.3993	0.4305	0.4580	0.4810	0.4997
-2.000	0.3502	0.3604	0.3738	0.3893	0.4206	0.4482	0.4710	0.4897
-1.000	0.3405	0.3500	0.3635	0.3771	0.4104	0.4370	0.4607	0.4793
0.	0.3301	0.3396	0.3532	0.3697	0.4009	0.4274	0.4502	0.4686
1.000	0.3104	0.3200	0.3426	0.3581	0.3893	0.4168	0.4392	0.4576
2.000	0.3005	0.3182	0.3318	0.3473	0.3784	0.4057	0.4232	0.4463
3.000	0.2978	0.3073	0.3229	0.3364	0.3674	0.3944	0.4165	0.4347
4.000	0.2867	0.2963	0.3098	0.3253	0.3561	0.3830	0.4050	0.4230
5.000	0.2756	0.2851	0.2986	0.3143	0.3447	0.3714	0.3932	0.4110
10.000	0.2132	0.2277	0.2418	0.2558	0.2854	0.3108	0.3315	0.3480
15.000	0.1547	0.1679	0.1806	0.1950	0.2232	0.2473	0.2666	0.2820

TABLE VI.- CONCLUDED

(c) $\delta = 80°$

c_m

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0581	-0.0566	-0.0546	-0.0522	-0.0473	-0.0427	-0.0386	-0.0350
-10.0000	-0.1142	-0.1114	-0.1073	-0.1025	-0.0925	-0.0832	-0.0751	-0.0682
-5.0000	-0.1772	-0.1670	-0.1617	-0.1544	-0.1393	-0.1253	-0.1131	-0.1026
-4.0000	-0.1838	-0.1773	-0.1726	-0.1649	-0.1487	-0.1337	-0.1207	-0.1096
-3.0000	-0.1955	-0.1906	-0.1836	-0.1753	-0.1581	-0.1422	-0.1284	-0.1165
-2.0000	-0.2071	-0.2020	-0.1945	-0.1858	-0.1675	-0.1507	-0.1360	-0.1234
-1.0000	-0.2197	-0.2133	-0.2054	-0.1962	-0.1769	-0.1591	-0.1436	-0.1304
0.	-0.2372	-0.2245	-0.2162	-0.2065	-0.1863	-0.1675	-0.1512	-0.1373
1.0000	-0.2417	-0.2357	-0.2270	-0.2168	-0.1955	-0.1759	-0.1587	-0.1441
2.0000	-0.2531	-0.2468	-0.2377	-0.2270	-0.2048	-0.1842	-0.1662	-0.1509
3.0000	-0.2644	-0.2578	-0.2483	-0.2372	-0.2139	-0.1924	-0.1737	-0.1577
4.0000	-0.2756	-0.2687	-0.2588	-0.2472	-0.2230	-0.2006	-0.1811	-0.1644
5.0000	-0.2866	-0.2795	-0.2692	-0.2571	-0.2320	-0.2087	-0.1884	-0.1711
10.0000	-0.3396	-0.3312	-0.3195	-0.3048	-0.2750	-0.2475	-0.2235	-0.2030
15.0000	-0.3875	-0.3780	-0.3642	-0.3480	-0.3141	-0.2827	-0.2554	-0.2321

c_N

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.0120	-0.0115	-0.0109	-0.0101	-0.0086	-0.0073	-0.0064	-0.0056
-10.0000	0.0664	0.0649	0.0625	0.0598	0.0542	0.0489	0.0442	0.0401
-5.0000	0.1441	0.1444	0.1390	0.1328	0.1197	0.1076	0.0972	0.0880
-4.0000	0.1646	0.1615	0.1545	0.1475	0.1330	0.1195	0.1077	0.0977
-3.0000	0.1811	0.1766	0.1700	0.1623	0.1462	0.1314	0.1184	0.1074
-2.0000	0.1776	0.1927	0.1955	0.1771	0.1595	0.1433	0.1292	0.1171
-1.0000	0.2141	0.2087	0.2000	0.1918	0.1728	0.1552	0.1399	0.1268
0.	0.2316	0.2247	0.2163	0.2065	0.1860	0.1672	0.1505	0.1365
1.0000	0.2459	0.2407	0.2317	0.2211	0.1992	0.1786	0.1612	0.1462
2.0000	0.2652	0.2566	0.2469	0.2357	0.2123	0.1906	0.1714	0.1558
3.0000	0.2774	0.2723	0.2621	0.2502	0.2253	0.2023	0.1823	0.1653
4.0000	0.2954	0.2890	0.2772	0.2645	0.2382	0.2139	0.1927	0.1748
5.0000	0.3113	0.3035	0.2921	0.2788	0.2510	0.2253	0.2031	0.1842
10.0000	0.3846	0.3782	0.3640	0.3474	0.3128	0.2808	0.2531	0.2295
15.0000	0.4591	0.4466	0.4299	0.4103	0.3694	0.3317	0.2990	0.2712

c_A

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	1.2427	1.2084	1.1089	1.1034	0.8141	0.6695	0.5629	0.4825
-10.0000	1.3557	1.2790	1.1738	1.0631	0.8644	0.7122	0.5994	0.5149
-5.0000	1.4175	1.3367	1.2292	1.1144	0.9085	0.7503	0.6329	0.5445
-4.0000	1.4276	1.3470	1.2387	1.1236	0.9164	0.7573	0.6390	0.5500
-3.0000	1.4377	1.3567	1.2480	1.1323	0.9241	0.7640	0.6440	0.5553
-2.0000	1.4473	1.3659	1.2567	1.1406	0.9314	0.7705	0.6507	0.5605
-1.0000	1.4562	1.3746	1.2650	1.1485	0.9384	0.7767	0.6563	0.5655
0.	1.4646	1.3828	1.2729	1.1559	0.9451	0.7827	0.6616	0.5704
1.0000	1.4723	1.3903	1.2801	1.1629	0.9514	0.7984	0.6669	0.5751
2.0000	1.4794	1.3973	1.2869	1.1694	0.9574	0.7938	0.6717	0.5796
3.0000	1.4860	1.4037	1.2932	1.1755	0.9630	0.7987	0.6764	0.5839
4.0000	1.4919	1.4095	1.2989	1.1810	0.9692	0.8038	0.6802	0.5880
5.0000	1.4971	1.4148	1.3041	1.1862	0.9731	0.8083	0.6851	0.5919
10.0000	1.5134	1.4318	1.3217	1.2043	0.9916	0.8264	0.7024	0.6082
15.0000	1.5132	1.4332	1.3253	1.2099	1.0001	0.8365	0.7130	0.6190

L/D

α, deg	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.2579	0.2578	0.2574	0.2572	0.2567	0.2563	0.2555	0.2555
-10.0000	0.2273	0.2271	0.2317	0.2349	0.2417	0.2480	0.2534	0.2577
-5.0000	0.1938	0.1974	0.2026	0.2088	0.2218	0.2339	0.2442	0.2527
-4.0000	0.1867	0.1907	0.1964	0.2031	0.2173	0.2303	0.2413	0.2507
-3.0000	0.1796	0.1838	0.1900	0.1972	0.2124	0.2264	0.2383	0.2483
-2.0000	0.1723	0.1767	0.1835	0.1912	0.2074	0.2223	0.2351	0.2456
-1.0000	0.1649	0.1697	0.1768	0.1850	0.2022	0.2180	0.2315	0.2426
0.	0.1574	0.1625	0.1699	0.1786	0.1968	0.2134	0.2275	0.2393
1.0000	0.1498	0.1552	0.1630	0.1721	0.1912	0.2085	0.2234	0.2357
2.0000	0.1421	0.1478	0.1559	0.1655	0.1854	0.2035	0.2189	0.2317
3.0000	0.1343	0.1402	0.1487	0.1587	0.1793	0.1982	0.2141	0.2273
4.0000	0.1263	0.1325	0.1414	0.1517	0.1731	0.1926	0.2089	0.2227
5.0000	0.1183	0.1247	0.1339	0.1446	0.1667	0.1867	0.2037	0.2178
10.0000	0.0766	0.0839	0.0945	0.1067	0.1318	0.1542	0.1731	0.1885
15.0000	0.0322	0.0403	0.0518	0.0652	0.0923	0.1162	0.1361	0.1523

(a) $\delta = 70°$

C_m

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.3992	-0.3957	-0.3901	-0.3829	-0.3652	-0.3456	-0.3260	-0.3074
-10.0000	-0.4653	-0.4612	-0.4548	-0.4465	-0.4262	-0.4036	-0.3810	-0.3594
-5.0000	-0.5285	-0.5240	-0.5168	-0.5075	-0.4847	-0.4593	-0.4338	-0.4095
-4.0000	-0.5407	-0.5360	-0.5287	-0.5192	-0.4959	-0.4700	-0.4440	-0.4191
-3.0000	-0.5526	-0.5479	-0.5404	-0.5307	-0.5070	-0.4805	-0.4540	-0.4286
-2.0000	-0.5644	-0.5596	-0.5519	-0.5421	-0.5179	-0.4909	-0.4638	-0.4379
-1.0000	-0.5759	-0.5710	-0.5632	-0.5532	-0.5285	-0.5011	-0.4735	-0.4471
0.	-0.5872	-0.5822	-0.5743	-0.5641	-0.5390	-0.5110	-0.4829	-0.4561
1.000	-0.5992	-0.5931	-0.5851	-0.5747	-0.5492	-0.5208	-0.4922	-0.4649
2.000	-0.6089	-0.6037	-0.5956	-0.5850	-0.5591	-0.5302	-0.5012	-0.4734
3.000	-0.6194	-0.6141	-0.6058	-0.5951	-0.5688	-0.5395	-0.5100	-0.4818
4.000	-0.6295	-0.6242	-0.6158	-0.6049	-0.5782	-0.5485	-0.5185	-0.4899
5.000	-0.6393	-0.6340	-0.6255	-0.6144	-0.5874	-0.5572	-0.5268	-0.4978
10.000	-0.6835	-0.6778	-0.6688	-0.6571	-0.6285	-0.5965	-0.5642	-0.5333
15.000	-0.7193	-0.7123	-0.7030	-0.6908	-0.6610	-0.6276	-0.5930	-0.5616

C_N

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3566	0.3529	0.3470	0.3395	0.3213	0.3014	0.2810	0.2637
-10.0000	0.4225	0.4181	0.4112	0.4024	0.3810	0.3578	0.3348	0.3134
-5.0000	0.4860	0.4810	0.4732	0.4631	0.4388	0.4122	0.3860	0.3615
-4.0000	0.4983	0.4932	0.4852	0.4749	0.4499	0.4227	0.3959	0.3708
-3.0000	0.5104	0.5051	0.4969	0.4864	0.4609	0.4331	0.4057	0.3799
-2.0000	0.5222	0.5169	0.5085	0.4977	0.4717	0.4433	0.4153	0.3890
-1.0000	0.5339	0.5284	0.5199	0.5089	0.4823	0.4533	0.4247	0.3978
0.	0.5453	0.5397	0.5310	0.5198	0.4927	0.4631	0.4339	0.4065
1.000	0.5565	0.5508	0.5419	0.5305	0.5029	0.4728	0.4430	0.4151
2.000	0.5674	0.5616	0.5526	0.5410	0.5129	0.4822	0.4519	0.4234
3.000	0.5781	0.5722	0.5630	0.5512	0.5226	0.4913	0.4605	0.4315
4.000	0.5884	0.5825	0.5731	0.5611	0.5321	0.5003	0.4689	0.4395
5.000	0.5985	0.5924	0.5830	0.5708	0.5412	0.5090	0.4771	0.4472
10.000	0.6440	0.6375	0.6274	0.6144	0.5829	0.5484	0.5143	0.4822
15.000	0.6834	0.6737	0.6630	0.6494	0.6163	0.5801	0.5443	0.5105

C_A

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	1.1900	1.1645	1.1250	1.0772	0.9730	.8736	0.7866	0.7127
-10.0000	1.3220	1.2938	1.2513	1.1999	1.0873	0.9794	0.8844	0.8033
-5.0000	1.4414	1.4116	1.3667	1.3122	1.1926	1.0773	0.9754	0.8880
-4.0000	1.4635	1.4334	1.3882	1.3331	1.2123	1.0957	0.9925	0.9039
-3.0000	1.4850	1.4547	1.4090	1.3535	1.2315	1.1136	1.0093	0.9195
-2.0000	1.5058	1.4752	1.4292	1.3732	1.2501	1.1311	1.0256	0.9348
-1.0000	1.5262	1.4951	1.4488	1.3924	1.2682	1.1481	1.0414	0.9496
0.	1.5454	1.5144	1.4677	1.4109	1.2857	1.1645	1.0567	0.9640
1.000	1.5640	1.5328	1.4859	1.4287	1.3026	1.1804	1.0717	0.9780
2.000	1.5819	1.5506	1.5033	1.4458	1.3189	1.1957	1.0861	0.9915
3.000	1.5990	1.5675	1.5200	1.4622	1.3345	1.2105	1.1000	1.0046
4.000	1.6153	1.5837	1.5360	1.4778	1.3474	1.2246	1.1133	1.0171
5.000	1.6328	1.5990	1.5512	1.4928	1.3637	1.2382	1.1261	1.0292
10.000	1.6950	1.6630	1.6146	1.5555	1.4243	1.2962	1.1813	1.0814
15.000	1.7362	1.7043	1.6561	1.5970	1.4657	1.3367	1.2206	1.1192

L/D

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.6169	0.6215	0.6283	0.6369	0.6562	0.6754	0.6929	0.7082
-10.0000	0.5255	0.5297	0.5360	0.5438	0.5614	0.5789	0.5946	0.6083
-5.0000	0.4376	0.4414	0.4473	0.4544	0.4706	0.4864	0.5036	0.5128
-4.0000	0.4204	0.4242	0.4300	0.4371	0.4528	0.4683	0.4823	0.4943
-3.0000	0.4034	0.4070	0.4127	0.4197	0.4352	0.4505	0.4641	0.4759
-2.0000	0.3864	0.3901	0.3956	0.4025	0.4178	0.4328	0.4462	0.4577
-1.0000	0.3696	0.3732	0.3787	0.3854	0.4004	0.4151	0.4283	0.4396
0.	0.3529	0.3564	0.3618	0.3684	0.3832	0.3977	0.4106	0.4217
1.000	0.3363	0.3398	0.3450	0.3516	0.3662	0.3804	0.3931	0.4040
2.000	0.3198	0.3232	0.3285	0.3349	0.3492	0.3632	0.3757	0.3863
3.000	0.3034	0.3068	0.3119	0.3183	0.3324	0.3461	0.3584	0.3688
4.000	0.2870	0.2904	0.2955	0.3017	0.3157	0.3292	0.3412	0.3516
5.000	0.2708	0.2741	0.2792	0.2853	0.2990	0.3124	0.3242	0.3343
10.000	0.1908	0.1939	0.1986	0.2044	0.2172	0.2296	0.2406	0.2499
15.000	0.1122	0.1151	0.1196	0.1251	0.1371	0.1487	0.1593	0.1677

TABLE VII.- CONCLUDED

(b) δ = 80°

$$c_m$$

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	-0.1846	-0.1823	-0.1787	-0.1741	-0.1633	-0.1518	-0.1408	-0.1306
-10.0000	-0.2305	-0.2276	-0.2231	-0.2174	-0.2039	-0.1897	-0.1759	-0.1632
-5.0000	-0.2754	-0.2720	-0.2666	-0.2598	-0.2438	-0.2268	-0.2104	-0.1953
-4.0000	-0.2842	-0.2806	-0.2751	-0.2681	-0.2516	-0.2340	-0.2171	-0.2016
-3.0000	-0.2928	-0.2892	-0.2835	-0.2763	-0.2592	-0.2412	-0.2238	-0.2078
-2.0000	-0.3014	-0.2976	-0.2918	-0.2844	-0.2668	-0.2482	-0.2304	-0.2139
-1.0000	-0.3098	-0.3059	-0.2999	-0.2923	-0.2743	-0.2552	-0.2368	-0.2199
0.	-0.3181	-0.3141	-0.3079	-0.3001	-0.2817	-0.2621	-0.2432	-0.2258
1.0000	-0.3262	-0.3221	-0.3158	-0.3078	-0.2889	-0.2688	-0.2495	-0.2317
2.0000	-0.3342	-0.3300	-0.3236	-0.3154	-0.2960	-0.2754	-0.2556	-0.2374
3.0000	-0.3423	-0.3377	-0.3311	-0.3227	-0.3029	-0.2819	-0.2617	-0.2430
4.0000	-0.3496	-0.3453	-0.3385	-0.3300	-0.3097	-0.2883	-0.2676	-0.2485
5.0000	-0.3571	-0.3526	-0.3458	-0.3370	-0.3164	-0.2944	-0.2733	-0.2539
10.0000	-0.3913	-0.3865	-0.3790	-0.3694	-0.3469	-0.3229	-0.2999	-0.2786
15.0000	-0.4197	-0.4145	-0.4065	-0.3963	-0.3722	-0.3466	-0.3220	-0.2993

$$c_N$$

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.1261	0.1245	0.1221	0.1190	0.1116	0.1037	0.0960	0.0890
-10.0000	0.1781	0.1758	0.1723	0.1679	0.1573	0.1461	0.1353	0.1253
-5.0000	0.2310	0.2270	0.2225	0.2167	0.2030	0.1884	0.1745	0.1617
-4.0000	0.2402	0.2371	0.2323	0.2263	0.2120	0.1968	0.1822	0.1688
-3.0000	0.2503	0.2471	0.2421	0.2358	0.2209	0.2051	0.1899	0.1760
-2.0000	0.2604	0.2570	0.2519	0.2453	0.2298	0.2133	0.1975	0.1830
-1.0000	0.2703	0.2669	0.2615	0.2547	0.2385	0.2215	0.2051	0.1900
0.	0.2802	0.2766	0.2710	0.2639	0.2472	0.2295	0.2125	0.1969
1.0000	0.2899	0.2862	0.2804	0.2731	0.2558	0.2375	0.2199	0.2037
2.0000	0.2994	0.2956	0.2896	0.2821	0.2642	0.2453	0.2271	0.2105
3.0000	0.3089	0.3049	0.2987	0.2909	0.2725	0.2530	0.2343	0.2171
4.0000	0.3181	0.3140	0.3077	0.2997	0.2807	0.2606	0.2413	0.2236
5.0000	0.3272	0.3230	0.3165	0.3082	0.2887	0.2680	0.2482	0.2300
10.0000	0.3696	0.3649	0.3575	0.3482	0.3261	0.3028	0.2804	0.2599
15.0000	0.4061	0.4009	0.3928	0.3876	0.3584	0.3328	0.3083	0.2858

$$c_A$$

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	1.4302	1.3983	1.3373	1.2641	1.1077	0.9632	0.8413	0.7414
-10.0000	1.5347	1.4917	1.4276	1.3505	1.1856	1.0329	0.9039	0.7979
-5.0000	1.6133	1.5687	1.5023	1.4224	1.2510	1.0921	0.9574	0.8466
-4.0000	1.6268	1.5820	1.5151	1.4348	1.2624	1.1025	0.9669	0.8553
-3.0000	1.6394	1.5944	1.5272	1.4465	1.2732	1.1124	0.9759	0.8636
-2.0000	1.6513	1.6061	1.5386	1.4575	1.2834	1.1217	0.9845	0.8715
-1.0000	1.6623	1.6170	1.5493	1.4678	1.2930	1.1306	0.9926	0.8790
0.	1.6725	1.6270	1.5591	1.4774	1.3019	1.1389	1.0003	0.8861
1.0000	1.6819	1.6363	1.5682	1.4862	1.3102	1.1466	1.0075	0.8927
2.0000	1.6904	1.6447	1.5764	1.4943	1.3179	1.1538	1.0142	0.8990
3.0000	1.6980	1.6522	1.5839	1.5017	1.3249	1.1604	1.0204	0.9048
4.0000	1.7048	1.6589	1.5906	1.5082	1.3312	1.1664	1.0260	0.9101
5.0000	1.7106	1.6648	1.5964	1.5140	1.3369	1.1718	1.0312	0.9150
10.0000	1.7264	1.6809	1.6129	1.5311	1.3547	1.1899	1.0492	0.9326
15.0000	1.7193	1.6748	1.6083	1.5281	1.3549	1.1927	1.0538	0.9384

$$L/D$$

α, deg \ m	.25	.50	.75	1.0	1.5	2.0	2.5	3.0
-15.0000	0.3641	0.3657	0.3683	0.3715	0.3789	0.3868	0.3941	0.4009
-10.0000	0.2985	0.3004	0.3035	0.3074	0.3164	0.3259	0.3348	0.3429
-5.0000	0.2330	0.2352	0.2387	0.2431	0.2534	0.2640	0.2741	0.2832
-4.0000	0.2198	0.2221	0.2257	0.2302	0.2407	0.2516	0.2618	0.2710
-3.0000	0.2067	0.2091	0.2127	0.2173	0.2280	0.2391	0.2495	0.2590
-2.0000	0.1937	0.1960	0.1998	0.2044	0.2153	0.2266	0.2372	0.2467
-1.0000	0.1806	0.1830	0.1868	0.1916	0.2026	0.2141	0.2249	0.2345
0.	0.1675	0.1700	0.1738	0.1786	0.1899	0.2015	0.2124	0.2222
1.0000	0.1544	0.1570	0.1608	0.1658	0.1772	0.1890	0.2001	0.2099
2.0000	0.1413	0.1439	0.1478	0.1529	0.1644	0.1764	0.1875	0.1976
3.0000	0.1283	0.1309	0.1348	0.1399	0.1516	0.1637	0.1751	0.1852
4.0000	0.1152	0.1178	0.1219	0.1270	0.1389	0.1511	0.1626	0.1728
5.0000	0.1021	0.1048	0.1089	0.1140	0.1261	0.1384	0.1500	0.1604
10.0000	0.0364	0.0393	0.0436	0.0491	0.0618	0.0748	0.0868	0.0976
15.0000	-0.0299	-0.0269	-0.0223	-0.0165	-0.0032	0.0103	0.0228	0.0338

TABLE VIII.- DIRECTIONAL AND LATERAL STABILITY DERIVATIVES

(a) θ_{XZ} = 20°.

m	δ, deg	30	40	50	60	70	80
0.25	c_{Y_β}	-0.0020	-0.0033	-0.0044	-0.0053	-0.0060	-0.0064
	c_{n_β}	.0022	.0054	.0091	.0128	.0195	.0179
	c_{l_β}	-.0012	-.0019	-.0022	-.0022	-.0017	-.0010
0.50	c_{Y_β}	-0.0053	-0.0088	-0.0116	-0.0138	-0.0154	-0.0164
	c_{n_β}	.0030	.0072	.0119	.0164	.0201	.0225
	c_{l_β}	-.0008	-.0013	-.0015	-.0014	-.0011	-.0006
0.75	c_{Y_β}	-0.0081	-0.0133	-0.0174	-0.0206	-0.0229	-0.0242
	c_{n_β}	.0039	.0090	.0146	.0198	.0242	.0270
	c_{l_β}	-.0004	-.0006	-.0007	-.0006	-.0005	-.0003
1.0	c_{Y_β}	-0.0105	-0.0169	-0.0218	-0.0257	-0.0284	-0.0301
	c_{n_β}	.0048	.0107	.0169	.0228	.0276	.0307
	c_{l_β}	0	0	0	0	0	0
1.5	c_{Y_β}	-0.0152	-0.0220	-0.0280	-0.0327	-0.0361	-0.0381
	c_{n_β}	.0064	.0133	.0206	.0273	.0328	.0364
	c_{l_β}	.0007	.0010	.0011	.0010	.0007	.0004
2.0	c_{Y_β}	-0.0168	-0.0254	-0.0321	-0.0373	-0.0411	-0.0434
	c_{n_β}	.0078	.0154	.0232	.0306	.0365	.0404
	c_{l_β}	.0013	.0017	.0018	.0017	.0013	.0007
2.5	c_{Y_β}	-0.0189	-0.0280	-0.0351	-0.0406	-0.0446	-0.0470
	c_{n_β}	.0089	.0169	.0252	.0330	.0392	.0433
	c_{l_β}	.0017	.0023	.0024	.0020	.0016	.0009
3.0	c_{Y_β}	-0.0205	-0.0299	-0.0373	-0.0431	-0.0472	-0.0498
	c_{n_β}	.0098	.0182	.0268	.0348	.0413	.0456
	c_{l_β}	.0021	.0027	.0029	.0026	.0019	.0010

TABLE VIII.- Continued

(b) $\theta_{XZ} = 30°$.

δ, deg m		40	50	60	70	80
0.25	c_{Y_β}	-0.0014	-0.0023	-0.0030	-0.0035	-0.0038
	c_{n_β}	.0025	.0056	.0089	.0116	.0135
	c_{l_β}	-.0014	-.0021	-.0022	-.0018	-.0010
0.50	c_{Y_β}	-0.0048	-0.0071	-0.0092	-0.0107	-0.0116
	c_{n_β}	.0030	.0066	.0102	.0133	.0153
	c_{l_β}	-.0010	-.0015	-.0015	-.0013	-.0007
0.75	c_{Y_β}	-0.0075	-0.0121	-0.0154	-0.0178	-0.0192
	c_{n_β}	.0036	.0078	.0118	.0151	.0173
	c_{l_β}	-.0005	-.0008	-.0008	-.0006	-.0003
1.0	c_{Y_β}	-0.0103	-0.0163	-0.0207	-0.0237	-0.0255
	c_{n_β}	.0044	.0090	.0134	.0169	.0192
	c_{l_β}	0	0	0	0	0
1.5	c_{Y_β}	-0.0149	-0.0228	-0.0283	-0.0322	-0.0344
	c_{n_β}	.0059	.0112	.0160	.0199	.0225
	c_{l_β}	.0010	.0013	.0013	.0010	.0006
2.0	c_{Y_β}	-0.0185	-0.0273	-0.0335	-0.0378	-0.0404
	c_{n_β}	.0072	.0129	.0181	.0222	.0249
	c_{l_β}	.0019	.0024	.0023	.0018	.0010
2.5	c_{Y_β}	-0.0213	-0.0306	-0.0372	-0.0418	-0.0447
	c_{n_β}	.0083	.0143	.0197	.0239	.0267
	c_{l_β}	.0026	.0032	.0031	.0024	.0013
3.0	c_{Y_β}	-0.0236	-0.0332	-0.0400	-0.0448	-0.0477
	c_{n_β}	.0093	.0155	.0209	.0253	.0281
	c_{l_β}	.0033	.0039	.0037	.0029	.0018

TABLE VIII.- Continued

(c) $\theta_{XZ} = 40°.$

δ, deg / m		50	60	70	80
0.25	c_{Y_β}	-0.0010	-0.0016	-0.0020	-0.0022
	c_{n_β}	.0028	.0059	.0086	.0104
	c_{l_β}	-.0014	-.0018	-.0017	-.0010
0.50	c_{Y_β}	-0.0033	-0.0054	-0.0067	-0.0075
	c_{n_β}	.0031	.0064	.0092	.0111
	c_{l_B}	-.0010	-.0014	-.0012	-.0007
0.75	c_{Y_β}	-0.0063	-0.0100	-0.0124	-0.0138
	c_{n_β}	.0036	.0071	.0101	.0121
	c_{l_β}	-.0006	-.0007	-.0006	-.0004
1.0	c_{Y_β}	-0.0093	-0.0145	-0.0178	-0.0197
	c_{n_β}	.0041	.0079	.0111	.0131
	c_{l_β}	0	0	0	0
1.5	c_{Y_β}	-0.0146	-0.0219	-0.0265	-0.0292
	c_{n_β}	.0053	.0095	.0128	.0149
	c_{l_β}	.0012	.0014	.0012	.0007
2.0	c_{Y_β}	-0.0189	-0.0274	-0.0328	-0.0359
	c_{n_β}	.0064	.0109	.0143	.0165
	c_{l_β}	.0023	.0026	.0022	.0012
2.5	c_{Y_β}	-0.0224	-0.0315	-0.0373	-0.0407
	c_{n_β}	.0074	.0102	.0155	.0177
	c_{l_β}	.0032	.0037	.0030	.0017
3.0	c_{Y_β}	-0.0252	-0.0348	-0.0408	-0.0443
	c_{n_β}	.0083	.0130	.0165	.0187
	c_{l_β}	.0041	.0045	.0036	.0020

TABLE VIII.- Concluded

(d) $\theta_{XZ} = 50°$.

δ, deg $\backslash$ m		60	70	80
0.25	c_{Y_β}	-0.0007	-0.0010	-0.0012
	c_{n_β}	.0031	.0059	.0078
	c_{l_β}	-.0012	-.0013	-.0008
0.50	c_{Y_β}	-0.0024	-0.0037	-0.0045
	c_{n_β}	.0032	.0061	.0081
	c_{l_β}	-.0009	-.0010	-.0006
0.75	c_{Y_β}	-0.0049	-0.0075	-0.0089
	c_{n_β}	.0035	.0065	.0085
	c_{l_β}	-.0005	-.0005	-.0003
1.0	c_{Y_β}	-0.0076	-0.0115	-0.0137
	c_{n_β}	.0038	.0070	.0090
	c_{l_β}	0	0	0
1.5	c_{Y_β}	-0.0131	-0.0192	-0.0225
	c_{n_β}	.0046	.0079	.0100
	c_{l_β}	.0011	.0012	.0007
2.0	c_{Y_β}	-0.0179	-0.0254	-0.0295
	c_{n_β}	.0055	.0089	.0109
	c_{l_β}	.0023	.0023	.0014
2.5	c_{Y_β}	-0.0219	-0.0304	-0.0348
	c_{n_β}	.0063	.0097	.0117
	c_{l_β}	.0034	.0033	.0019
3.0	c_{Y_β}	-0.0252	-0.0343	-0.0390
	c_{n_β}	.0070	.0104	.0124
	c_{l_β}	.0043	.0041	.0024

(e) $\theta_{XZ} = 60°$.

δ, deg $\backslash$ m		70	80
0.25	c_{Y_β}	-0.0004	-0.0006
	c_{n_β}	.0032	.0054
	c_{l_β}	-.0008	-.0006
0.50	c_{Y_β}	-0.0016	-0.0023
	c_{n_β}	.0033	.0055
	c_{l_β}	-.0006	-.0005
0.75	c_{Y_β}	-0.0034	-0.0049
	c_{n_β}	.0034	.0057
	c_{l_β}	-.0004	-.0003
1.0	c_{Y_β}	-0.0056	-0.0079
	c_{n_β}	.0036	.0059
	c_{l_β}	0	0
1.5	c_{Y_β}	-0.0104	-0.0146
	c_{n_β}	.0040	.0063
	c_{l_β}	.0009	.0006
2.0	c_{Y_β}	-0.0152	-0.0209
	c_{n_β}	.0045	.0068
	c_{l_β}	.0018	.0013
2.5	c_{Y_β}	-0.0195	-0.0263
	c_{n_β}	.0050	.0073
	c_{l_β}	.0028	.0020
3.0	c_{Y_β}	-0.0233	-0.0308
	c_{n_β}	.0054	.0077
	c_{l_β}	.0038	.0026

TABLE IX. - LONGITUDINAL AERODYNAMICS OF RAKED-OFF ELLIPTICAL CONES

$$\theta_{xz} = 30° \quad \delta = 40°$$

m = 0.25

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.328	0.461	0.471	0.461	0.471	0.978
10	-0.523	0.745	0.638	0.622	0.758	0.821
20	-0.722	1.031	0.803	0.694	1.107	0.627
30	-0.904	1.286	0.947	0.640	1.463	0.438
40	-1.045	1.479	1.050	0.458	1.755	0.261
50	-1.130	1.590	1.100	0.180	1.925	0.093
60	-1.148	1.607	1.089	-0.139	1.936	-0.072
70	-1.098	1.528	1.017	-0.434	1.783	-0.243
80	-0.984	1.362	0.894	-0.644	1.497	-0.430
90	-0.822	1.130	0.723	-0.733	1.130	-0.649
100	-0.630	0.860	0.552	-0.693	0.752	-0.922
110	-0.432	0.585	0.371	-0.549	0.423	-1.297
120	-0.252	0.337	0.211	-0.351	0.186	-1.886
130	-0.110	0.145	0.089	-0.162	0.054	-3.015
140	-0.024	0.031	0.019	-0.036	0.006	-6.288
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.000	-0.001	0.001	0.001	0.000	9.043
230	0.001	-0.006	0.004	0.007	0.002	3.155
240	0.002	-0.015	0.010	0.017	0.008	1.992
250	0.004	-0.028	0.019	0.027	0.020	1.380
260	0.007	-0.043	0.030	0.037	0.037	1.003
270	0.009	-0.058	0.043	0.043	0.058	0.740
280	0.011	-0.072	0.057	0.044	0.081	0.543
290	0.013	-0.083	0.073	0.040	0.103	0.390
300	0.014	-0.090	0.090	0.033	0.122	0.269
310	0.014	-0.090	0.107	0.024	0.137	0.176
320	0.012	-0.082	0.125	0.018	0.148	0.119
330	0.005	-0.058	0.148	0.024	0.158	0.151
340	-0.048	0.033	0.211	0.104	0.187	0.555
350	-0.164	0.214	0.323	0.267	0.281	0.949
360	-0.328	0.461	0.471	0.461	0.471	0.978

m = 0.50

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.318	0.440	0.416	0.440	0.416	1.058
10	-0.506	0.713	0.576	0.602	0.691	0.871
20	-0.701	0.990	0.737	0.678	1.031	0.658
30	-0.879	1.237	0.879	0.632	1.380	0.458
40	-1.018	1.425	0.985	0.459	1.671	0.275
50	-1.101	1.535	1.039	0.191	1.844	0.103
60	-1.120	1.554	1.035	-0.119	1.863	-0.064
70	-1.071	1.479	0.972	-0.408	1.723	-0.237
80	-0.962	1.321	0.858	-0.616	1.450	-0.425
90	-0.804	1.098	0.707	-0.707	1.098	-0.643
100	-0.617	0.838	0.534	-0.671	0.732	-0.916
110	-0.424	0.571	0.360	-0.534	0.413	-1.292
120	-0.247	0.330	0.206	-0.343	0.183	-1.879
130	-0.108	0.143	0.088	-0.159	0.053	-3.005
140	-0.024	0.031	0.018	-0.035	0.006	-6.327
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.000	-0.001	0.001	0.001	0.000	5.824
230	0.001	-0.006	0.004	0.007	0.002	3.109
240	0.002	-0.015	0.010	0.016	0.008	1.976
250	0.004	-0.027	0.018	0.026	0.019	1.368
260	0.006	-0.041	0.028	0.035	0.035	0.988
270	0.008	-0.055	0.040	0.040	0.055	0.720
280	0.011	-0.068	0.052	0.039	0.076	0.518
290	0.012	-0.078	0.064	0.034	0.095	0.357
300	0.013	-0.083	0.077	0.025	0.111	0.224
310	0.013	-0.083	0.089	0.014	0.121	0.119
320	0.011	-0.076	0.101	0.006	0.126	0.050
330	0.005	-0.055	0.117	0.011	0.129	0.082
340	-0.045	0.031	0.172	0.088	0.151	0.581
350	-0.157	0.203	0.275	0.248	0.236	1.050
360	-0.318	0.440	0.416	0.440	0.416	1.058

m = 0.65

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.309	0.425	0.383	0.425	0.383	1.108
10	-0.494	0.690	0.539	0.586	0.650	0.901
20	-0.685	0.960	0.696	0.664	0.982	0.676
30	-0.859	1.201	0.836	0.622	1.325	0.469
40	-0.996	1.385	0.942	0.456	1.612	0.283
50	-1.078	1.493	0.998	0.196	1.785	0.110
60	-1.097	1.513	0.997	-0.107	1.809	-0.059
70	-1.050	1.442	0.940	-0.390	1.677	-0.232
80	-0.943	1.290	0.832	-0.596	1.415	-0.421
90	-0.789	1.073	0.687	-0.687	1.073	-0.640
100	-0.606	0.820	0.520	-0.655	0.717	-0.913
110	-0.417	0.560	0.352	-0.522	0.406	-1.287
120	-0.243	0.324	0.202	-0.337	0.180	-1.873
130	-0.107	0.140	0.086	-0.156	0.052	-2.999
140	-0.024	0.030	0.018	-0.035	0.006	-6.249
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.000	-0.001	0.001	0.001	0.000	5.824
230	0.001	-0.006	0.004	0.007	0.002	3.142
240	0.002	-0.015	0.009	0.016	0.008	1.967
250	0.004	-0.026	0.017	0.025	0.019	1.361
260	0.006	-0.039	0.027	0.033	0.034	0.979
270	0.008	-0.053	0.037	0.037	0.053	0.708
280	0.010	-0.065	0.048	0.036	0.072	0.503
290	0.012	-0.074	0.059	0.030	0.090	0.337
300	0.012	-0.079	0.069	0.020	0.103	0.197
310	0.012	-0.079	0.079	0.009	0.111	0.084
320	0.011	-0.072	0.088	0.001	0.114	0.007
330	0.005	-0.053	0.101	0.004	0.114	0.036
340	-0.044	0.029	0.150	0.079	0.131	0.599
350	-0.153	0.195	0.248	0.235	0.211	1.116
360	-0.309	0.425	0.383	0.425	0.383	1.108

TABLE X. - LONGITUDINAL AERODYNAMICS OF RAKED-OFF ELLIPTICAL CONES

$$\theta_{xz} = 30° \quad \delta = 50°$$

m = 0.25

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.347	0.400	0.630	0.400	0.630	0.634
10	-0.566	0.700	0.773	0.555	0.883	0.629
20	-0.784	0.994	0.911	0.622	1.196	0.520
30	-0.976	1.245	1.028	0.564	1.513	0.373
40	-1.120	1.427	1.107	0.381	1.765	0.216
50	-1.201	1.524	1.134	0.111	1.897	0.059
60	-1.210	1.529	1.103	-0.191	1.876	-0.102
70	-1.146	1.441	1.016	-0.462	1.702	-0.271
80	-1.017	1.274	0.880	-0.646	1.407	-0.459
90	-0.840	1.047	0.710	-0.710	1.047	-0.679
100	-0.636	0.788	0.525	-0.654	0.685	-0.955
110	-0.430	0.528	0.346	-0.506	0.378	-1.337
120	-0.245	0.298	0.191	-0.315	0.163	-1.932
130	-0.104	0.125	0.078	-0.140	0.046	-3.065
140	-0.022	0.026	0.016	-0.030	0.005	-6.405
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.001	-0.003	0.002	0.004	0.001	5.954
230	0.005	-0.017	0.011	0.019	0.006	3.158
240	0.013	-0.042	0.028	0.045	0.023	1.997
250	0.024	-0.077	0.053	0.076	0.054	1.410
260	0.037	-0.119	0.087	0.106	0.102	1.039
270	0.052	-0.164	0.126	0.126	0.164	0.771
280	0.066	-0.205	0.168	0.130	0.231	0.561
290	0.077	-0.239	0.210	0.115	0.296	0.389
300	0.085	-0.260	0.248	0.084	0.349	0.242
310	0.087	-0.265	0.280	0.044	0.383	0.114
320	0.082	-0.250	0.306	0.005	0.396	0.013
330	0.061	-0.204	0.336	-0.009	0.393	-0.022
340	-0.014	-0.081	0.398	0.059	0.401	0.148
350	-0.156	0.128	0.500	0.213	0.470	0.453
360	-0.347	0.400	0.630	0.400	0.630	0.634

m = 0.50

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.331	0.379	0.537	0.379	0.537	0.705
10	-0.539	0.663	0.674	0.536	0.779	0.688
20	-0.748	0.942	0.810	0.608	1.084	0.561
30	-0.933	1.181	0.928	0.559	1.395	0.401
40	-1.073	1.356	1.013	0.388	1.647	0.235
50	-1.152	1.451	1.048	0.130	1.785	0.073
60	-1.162	1.459	1.028	-0.161	1.778	-0.090
70	-1.103	1.379	0.953	-0.424	1.622	-0.261
80	-0.981	1.222	0.831	-0.606	1.348	-0.450
90	-0.813	1.007	0.675	-0.675	1.007	-0.670
100	-0.617	0.760	0.502	-0.626	0.662	-0.946
110	-0.418	0.512	0.332	-0.487	0.367	-1.327
120	-0.239	0.290	0.185	-0.305	0.159	-1.921
130	-0.102	0.122	0.076	-0.137	0.045	-3.050
140	-0.022	0.026	0.015	-0.030	0.005	-6.382
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.001	-0.003	0.002	0.004	0.001	6.473
230	0.005	-0.017	0.010	0.019	0.006	3.136
240	0.012	-0.041	0.026	0.043	0.022	1.974
250	0.023	-0.074	0.050	0.073	0.052	1.390
260	0.035	-0.113	0.060	0.099	0.097	1.016
270	0.048	-0.154	0.115	0.115	0.154	0.747
280	0.061	-0.192	0.151	0.115	0.215	0.535
290	0.071	-0.222	0.184	0.097	0.271	0.359
300	0.077	-0.240	0.214	0.065	0.314	0.207
310	0.079	-0.243	0.236	0.025	0.338	0.074
320	0.074	-0.229	0.253	-0.012	0.341	-0.036
330	0.055	-0.186	0.272	-0.025	0.329	-0.077
340	-0.015	-0.073	0.323	0.042	0.329	0.127
350	-0.149	0.123	0.415	0.193	0.388	0.498
360	-0.331	0.379	0.537	0.379	0.537	0.705

m = 0.75

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.310	0.352	0.451	0.352	0.451	0.781
10	-0.506	0.617	0.580	0.507	0.678	0.748
20	-0.703	0.878	0.710	0.582	0.968	0.601
30	-0.879	1.103	0.827	0.542	1.267	0.428
40	-1.013	1.269	0.913	0.385	1.515	0.254
50	-1.090	1.361	0.954	0.144	1.656	0.087
60	-1.102	1.372	0.943	-0.131	1.660	-0.079
70	-1.048	1.300	0.880	-0.383	1.523	-0.251
80	-0.935	1.156	0.772	-0.560	1.272	-0.440
90	-0.776	0.955	0.631	-0.631	0.955	-0.660
100	-0.591	0.724	0.472	-0.591	0.631	-0.936
110	-0.401	0.489	0.315	-0.463	0.352	-1.315
120	-0.231	0.279	0.177	-0.293	0.154	-1.907
130	-0.099	0.119	0.074	-0.133	0.044	-3.034
140	-0.021	0.025	0.015	-0.029	0.005	-6.384
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.001	-0.003	0.002	0.004	0.001	7.120
230	0.005	-0.016	0.010	0.018	0.006	3.126
240	0.012	-0.039	0.025	0.041	0.021	1.960
250	0.021	-0.070	0.047	0.068	0.049	1.369
260	0.033	-0.105	0.073	0.091	0.091	0.994
270	0.044	-0.142	0.103	0.103	0.143	0.723
280	0.055	-0.176	0.133	0.100	0.196	0.509
290	0.064	-0.202	0.159	0.081	0.244	0.330
300	0.069	-0.217	0.181	0.048	0.279	0.174
310	0.070	-0.219	0.196	0.010	0.294	0.033
320	0.065	-0.205	0.206	-0.025	0.289	-0.087
330	0.049	-0.168	0.216	-0.037	0.271	-0.137
340	-0.014	-0.065	0.257	0.027	0.264	0.100
350	-0.139	0.115	0.339	0.172	0.314	0.550
360	-0.310	0.352	0.451	0.352	0.451	0.781

TABLE XI.- LONGITUDINAL AERODYNAMICS OF RAKED-OFF ELLIPTICAL CONES

$$\theta_{xz} = 40° \quad \delta = 50°$$

m = 0.25

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.459	0.606	0.805	0.606	0.805	0.753
10	-0.635	0.849	1.009	0.661	1.141	0.579
20	-0.795	1.067	1.183	0.598	1.476	0.405
30	-0.920	1.234	1.304	0.416	1.746	0.238
40	-0.995	1.330	1.359	0.145	1.896	0.076
50	-1.011	1.344	1.341	-0.163	1.892	-0.086
60	-0.966	1.278	1.248	-0.442	1.731	-0.256
70	-0.865	1.138	1.092	-0.637	1.443	-0.441
80	-0.722	0.944	0.891	-0.714	1.084	-0.658
90	-0.553	0.717	0.668	-0.668	0.717	-0.931
100	-0.379	0.487	0.447	-0.525	0.402	-1.307
110	-0.220	0.280	0.253	-0.334	0.176	-1.896
120	-0.096	0.120	0.1C7	-0.153	0.050	-3.032
130	-0.021	0.025	0.022	-0.033	0.005	-6.332
140	C.	0.	0.	0.	0.	—
150	C.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	C.	0.	0.	0.	0.	—
230	0.0C0	-0.001	0.0C1	0.001	0.000	6.799
240	0.0C1	-0.005	0.0C4	0.006	0.002	3.152
250	0.0C2	-0.011	0.011	0.014	0.007	2.026
260	0.0C3	-0.021	0.021	0.024	0.017	1.414
270	0.0C5	-0.032	0.034	0.034	0.032	1.040
280	0.0C7	-0.044	0.050	0.042	0.052	0.798
290	0.0C8	-0.055	0.070	0.047	0.075	0.629
3C0	0.0C9	-0.062	0.095	0.051	0.101	0.508
310	0.0C9	-0.064	0.125	0.055	0.129	0.424
320	0.0C4	-0.052	0.165	0.066	0.160	0.415
330	-0.042	0.018	0.254	0.143	0.211	0.679
340	-0.143	0.165	0.403	0.293	0.322	0.908
350	-0.288	0.369	0.594	0.466	0.521	0.895
360	-0.459	0.606	0.8C5	0.606	0.805	0.753

m = 0.50

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.449	0.589	0.753	0.589	0.753	0.782
10	-0.622	0.826	0.953	0.648	1.082	0.599
20	-0.780	1.039	1.124	0.592	1.411	0.419
30	-0.903	1.203	1.246	0.418	1.681	0.249
40	-0.977	1.298	1.305	0.155	1.834	0.085
50	-0.993	1.313	1.292	-0.146	1.837	-0.079
60	-0.949	1.249	1.208	-0.421	1.686	-0.250
70	-0.851	1.114	1.060	-0.615	1.410	-0.437
80	-0.711	0.925	0.868	-0.694	1.061	-0.654
90	-0.545	0.704	0.652	-0.653	0.704	-0.927
100	-0.374	0.478	0.438	-0.515	0.395	-1.303
110	-0.217	0.275	0.249	-0.328	0.173	-1.892
120	-0.095	0.118	0.105	-0.151	0.050	-3.024
130	-0.021	0.025	0.022	-0.033	0.005	-6.308
140	0.	0.	0.	0.	0.	—
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.	0.	0.	0.	0.	—
230	0.000	-0.001	0.001	0.001	0.000	6.799
240	0.001	-0.004	0.004	0.006	0.002	3.276
250	0.002	-0.011	0.011	0.014	0.007	2.023
260	0.003	-0.020	0.020	0.023	0.017	1.406
270	0.005	-0.031	0.032	0.032	0.031	1.026
280	0.006	-0.042	0.047	0.039	0.050	0.780
290	0.008	-0.052	0.065	0.043	0.071	0.604
300	0.009	-0.059	0.086	0.045	0.095	0.475
310	0.009	-0.061	0.111	0.046	0.118	0.388
320	0.004	-0.050	0.145	0.054	0.143	0.380
330	-0.040	0.017	0.226	0.128	0.187	0.683
340	-0.139	0.159	0.367	0.275	0.290	0.946
350	-0.281	0.357	0.550	0.447	0.480	0.933
360	-0.449	0.589	0.753	0.589	0.753	0.782

m = 0.75

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.435	0.565	0.692	0.565	0.692	0.816
10	-0.603	0.793	0.884	0.628	1.009	0.622
20	-0.757	1.000	1.052	0.580	1.330	0.436
30	-0.878	1.159	1.173	0.417	1.596	0.261
40	-0.951	1.252	1.235	0.165	1.751	0.094
50	-0.967	1.269	1.229	-0.126	1.762	-0.071
60	-0.925	1.209	1.154	-0.395	1.623	-0.243
70	-0.831	1.079	1.017	-0.587	1.362	-0.431
80	-0.694	0.897	0.836	-0.667	1.029	-0.648
90	-0.533	0.684	0.630	-0.631	0.684	-0.921
1C0	-0.366	0.466	0.425	-0.499	0.385	-1.297
110	-0.213	0.269	0.243	-0.320	0.170	-1.884
120	-0.093	0.116	0.1C3	-0.148	0.049	-3.017
130	-0.021	0.025	0.022	-0.033	0.005	-6.272
140	0.	0.	0.	0.	0.	—
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
2C0	C.	0.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.	0.	0.	0.	0.	—
230	0.000	-0.001	0.0C1	0.001	0.000	6.799
240	0.001	-0.004	0.0C4	0.006	0.002	3.128
250	0.002	-0.011	0.010	0.013	0.007	1.994
260	0.0C3	-0.020	0.019	0.022	0.016	1.382
270	0.005	-0.030	0.030	0.030	0.030	1.010
280	0.006	-0.040	0.043	0.036	0.047	0.757
290	0.008	-0.049	0.058	0.038	0.066	0.573
3C0	0.0C9	-0.056	0.076	0.038	0.086	0.437
310	0.008	-0.058	0.096	0.036	0.106	0.343
320	0.004	-0.048	0.123	0.042	0.125	0.334
330	-0.038	0.015	0.195	0.111	0.161	0.688
340	-0.134	0.151	0.325	0.253	0.254	0.996
350	-0.272	0.342	0.498	0.423	0.431	0.981
360	-0.435	0.565	0.692	0.565	0.692	0.816

m = 1.00

α	C_m	C_N	C_A	C_L	C_D	L/D
0	-0.419	0.538	0.634	0.538	0.634	0.849
10	-0.582	0.758	0.818	0.604	0.937	0.645
20	-0.731	0.956	0.980	0.563	1.248	0.452
30	-0.849	1.110	1.110	0.411	1.508	0.273
40	-0.920	1.201	1.164	0.172	1.663	0.103
50	-0.937	1.218	1.163	-0.108	1.680	-0.064
60	-0.897	1.162	1.095	-0.368	1.554	-0.237
70	-0.806	1.039	0.969	-0.556	1.308	-0.425
80	-0.674	0.865	0.799	-0.637	0.991	-0.643
90	-0.518	0.661	0.605	-0.605	0.661	-0.915
100	-0.356	0.451	0.409	-0.482	0.373	-1.290
110	-0.208	0.261	0.235	-0.310	0.165	-1.876
120	-0.092	0.113	0.100	-0.144	0.048	-3.002
130	-0.020	0.024	0.021	-0.032	0.005	-6.316
140	0.	0.	0.	0.	0.	—
150	0.	0.	0.	0.	0.	—
160	0.	0.	0.	0.	0.	—
170	0.	0.	0.	0.	0.	—
180	0.	0.	0.	0.	0.	—
190	0.	0.	0.	0.	0.	—
200	0.	C.	0.	0.	0.	—
210	0.	0.	0.	0.	0.	—
220	0.	0.	0.	0.	0.	—
230	0.000	-0.001	0.001	0.001	0.000	6.799
240	0.001	-0.004	0.004	0.006	0.002	3.116
250	0.002	-0.010	0.010	0.013	0.006	1.963
260	0.003	-0.019	0.018	0.021	0.015	1.371
270	0.004	-0.028	0.028	0.028	0.028	0.993
280	0.006	-0.038	0.039	0.032	0.044	0.736
290	0.007	-0.046	0.052	0.034	0.061	0.546
300	0.008	-0.052	0.067	0.032	0.079	0.403
310	0.008	-0.054	0.082	0.028	0.094	0.298
320	0.004	-0.046	0.103	0.031	0.109	0.287
330	-0.036	0.014	0.168	0.096	0.138	0.692
340	-0.128	0.142	0.288	0.232	0.222	1.047
350	-0.261	0.325	0.450	0.398	0.387	1.029
360	-0.419	0.538	0.634	0.538	0.634	0.849

$$\theta_{XY}, \text{ deg}$$

θ_{XZ} / m	20°	30°	40°	50°	60°
0.25	55.516	66.587	73.409	78.153	81.787
0.50	36.052	49.107	59.210	67.240	73.898
0.75	25.887	37.589	48.210	57.819	66.587
1.00	20.000	30.000	40.000	50.000	60.000
1.50	13.638	21.052	29.222	38.468	49.107
2.00	10.314	16.102	22.760	30.791	40.894
2.50	8.283	13.004	18.554	25.488	34.716
3.00	6.917	10.893	15.626	21.666	30.001

$$S = \pi ab$$
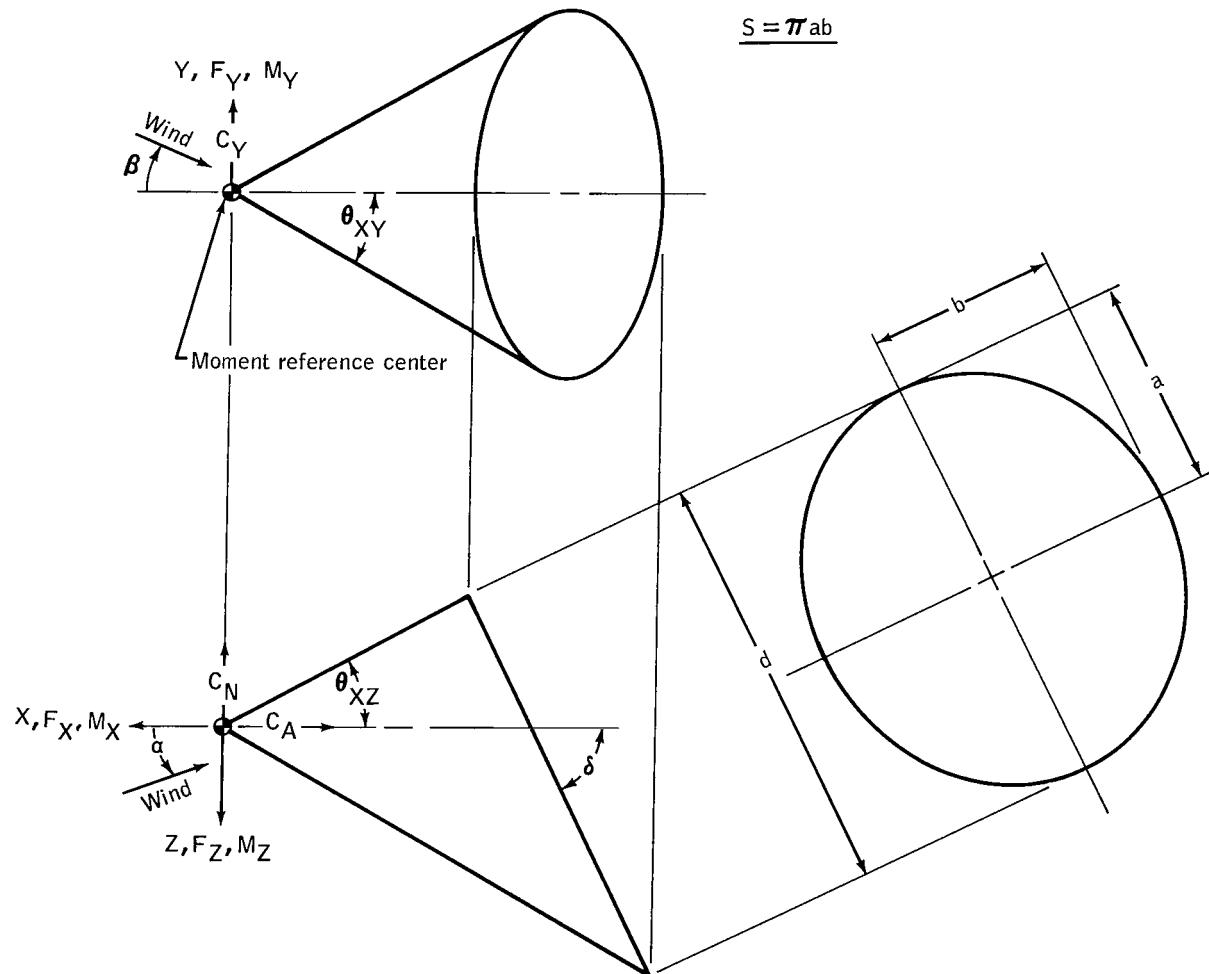
Note: δ varies from ($\theta_{XZ} + 10°$) to 80° in 10° increments

Figure 1. – Raked-off elliptical cone.
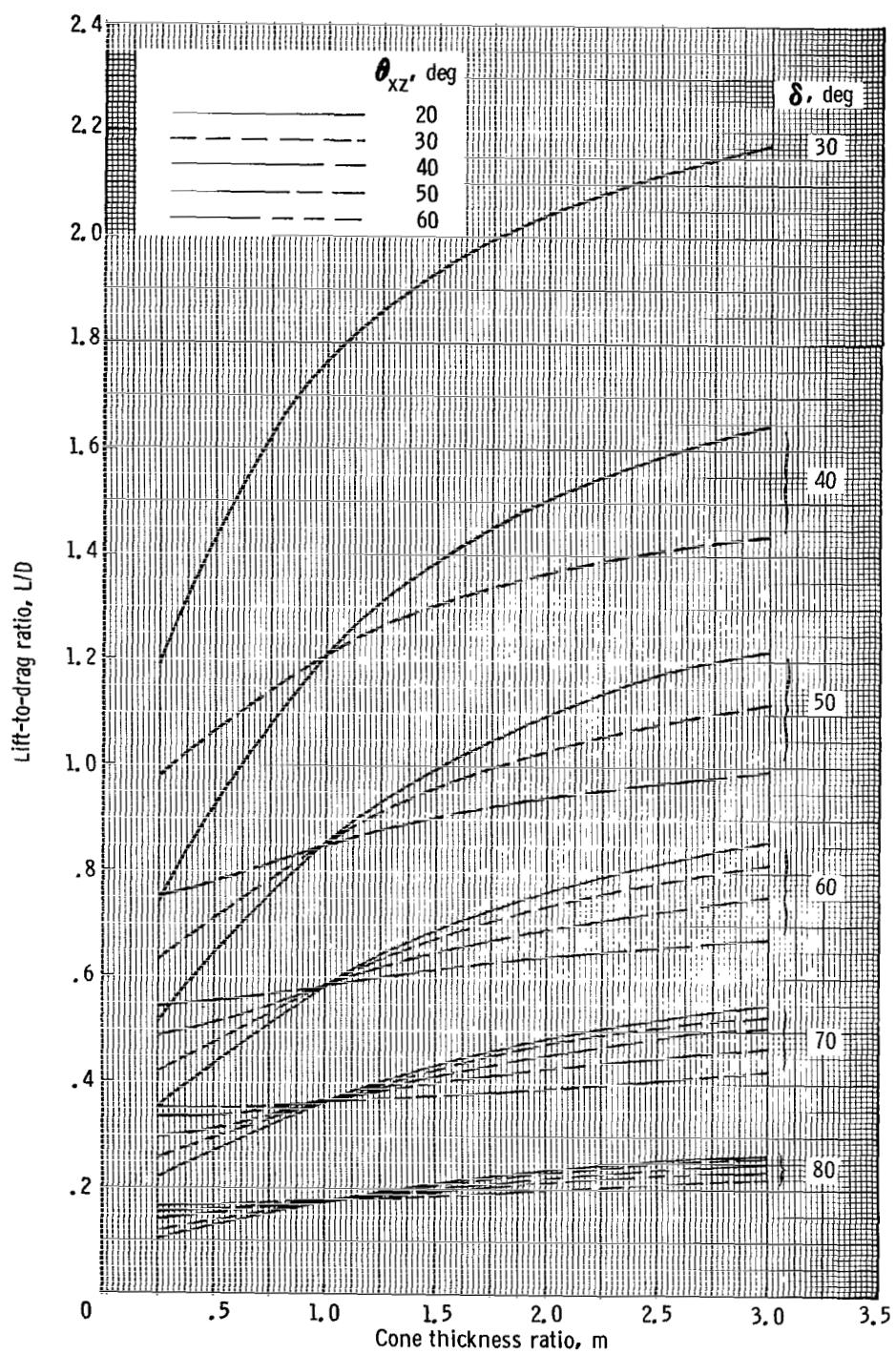
Figure 2. – Summary of lift-to-drag ratios at zero angle of attack of raked-off elliptical cones
against cone thickness ratio.

X

Z

Most forward c.g. location

Locus of c.g.'s for trim at $\alpha = 0°$
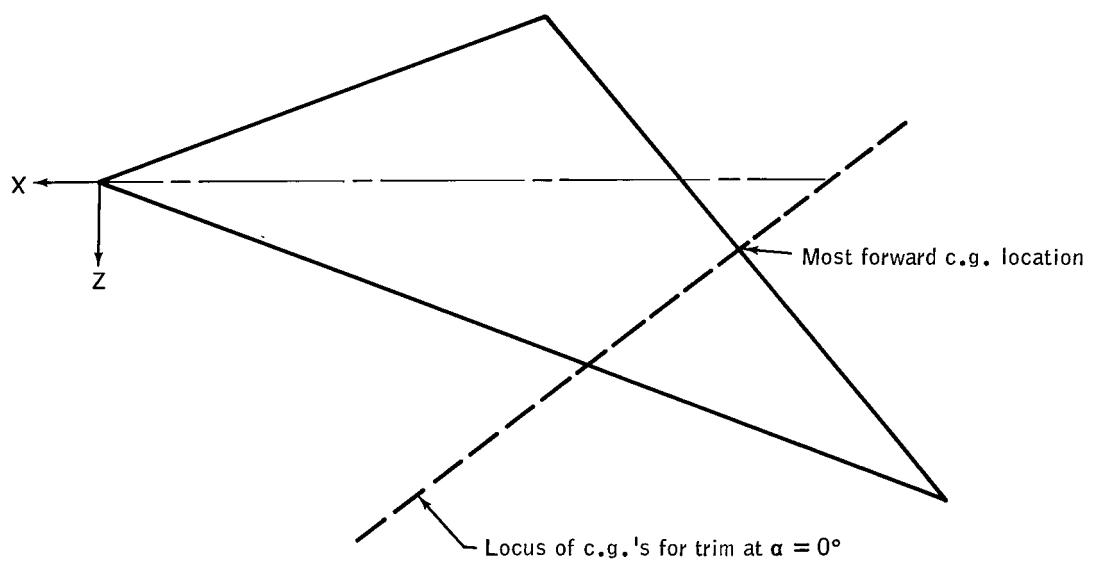
Figure 3. - Line to trim at $\alpha = 0°$ for typical raked-off cone.
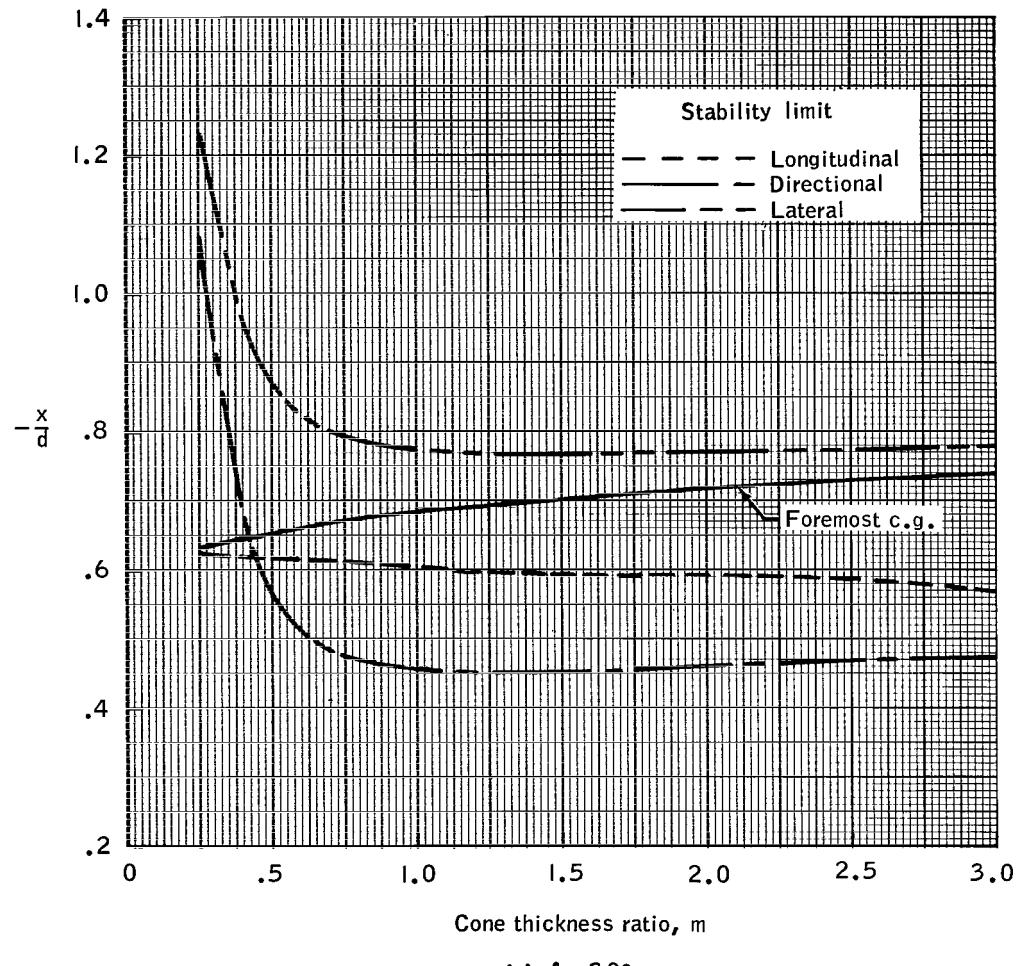
Figure 4. - Stability and foremost center-of-gravity limits plotted against cone thickness ratio. $\theta_{xz} = 20°$.
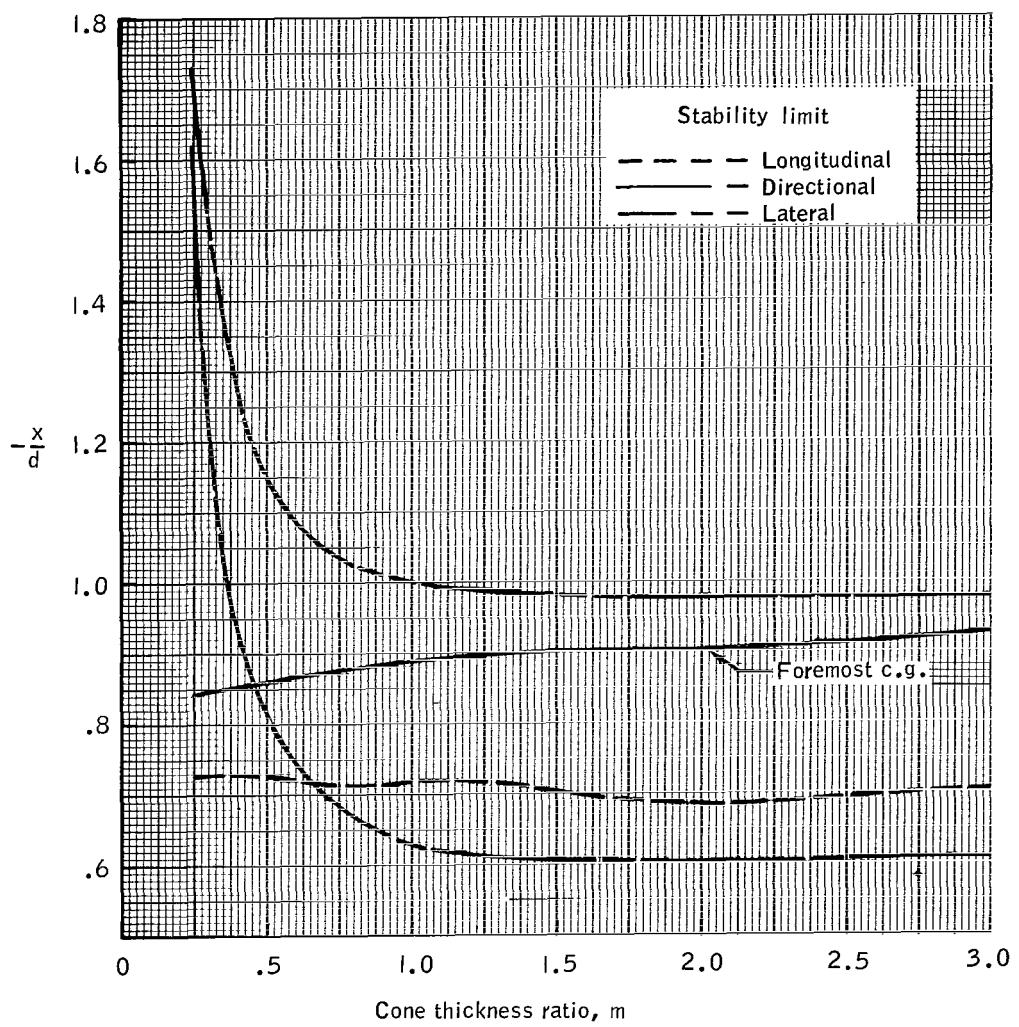
(b) $\delta = 40°$.

Figure 4. – Continued.

(c) $\delta = 50°$.

Figure 4.-Continued.

(d) $\delta = 60°$.

Figure 4. - Continued.

(e) $\delta = 70°$.
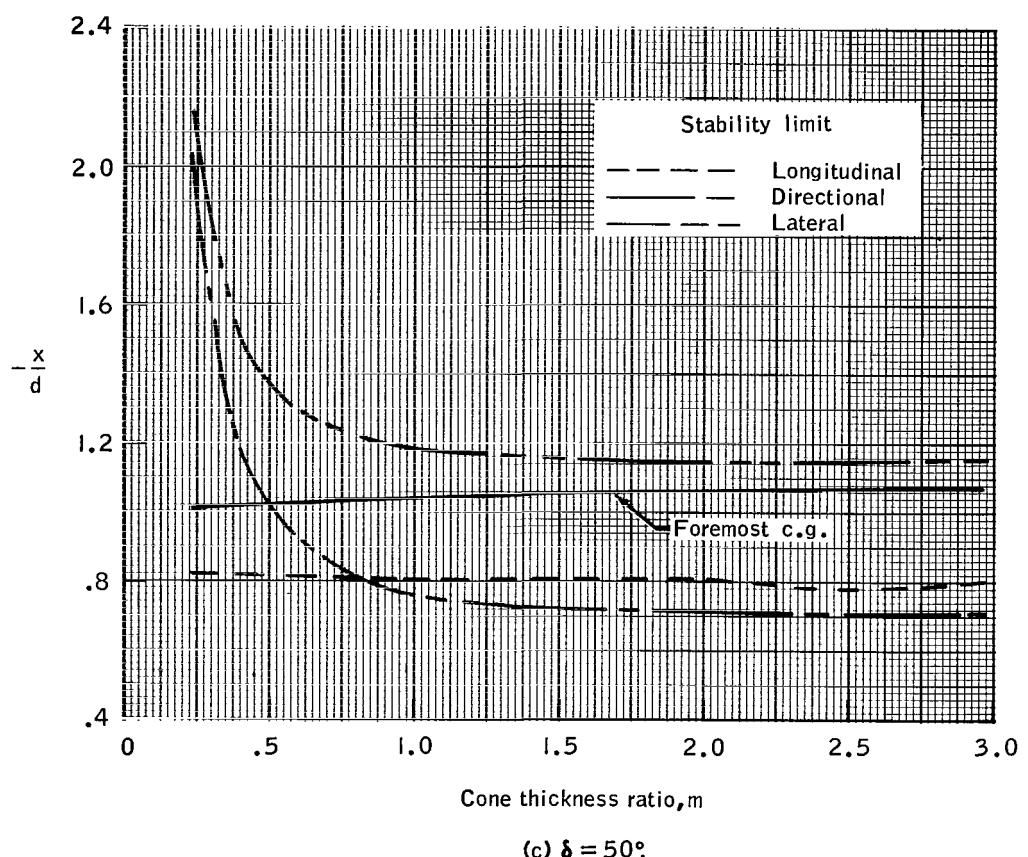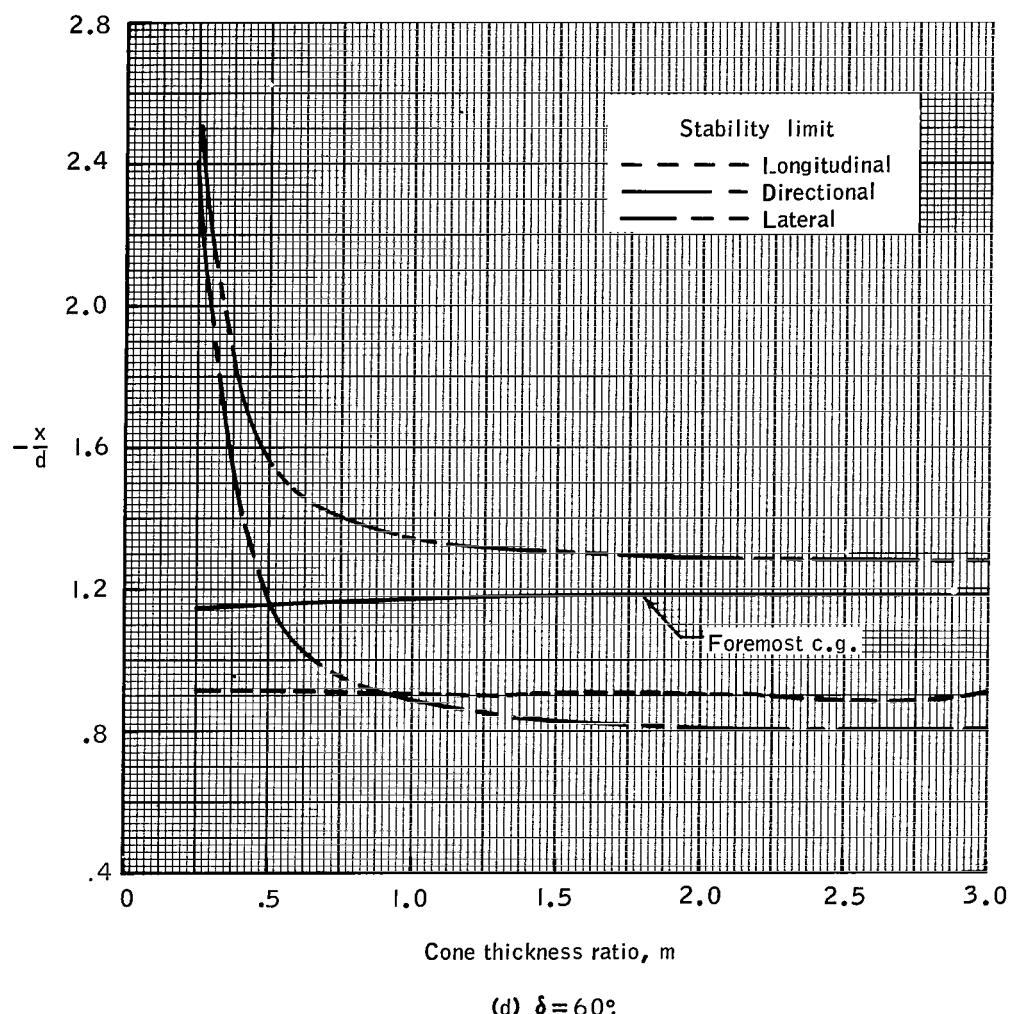
Figure 4. - Continued.
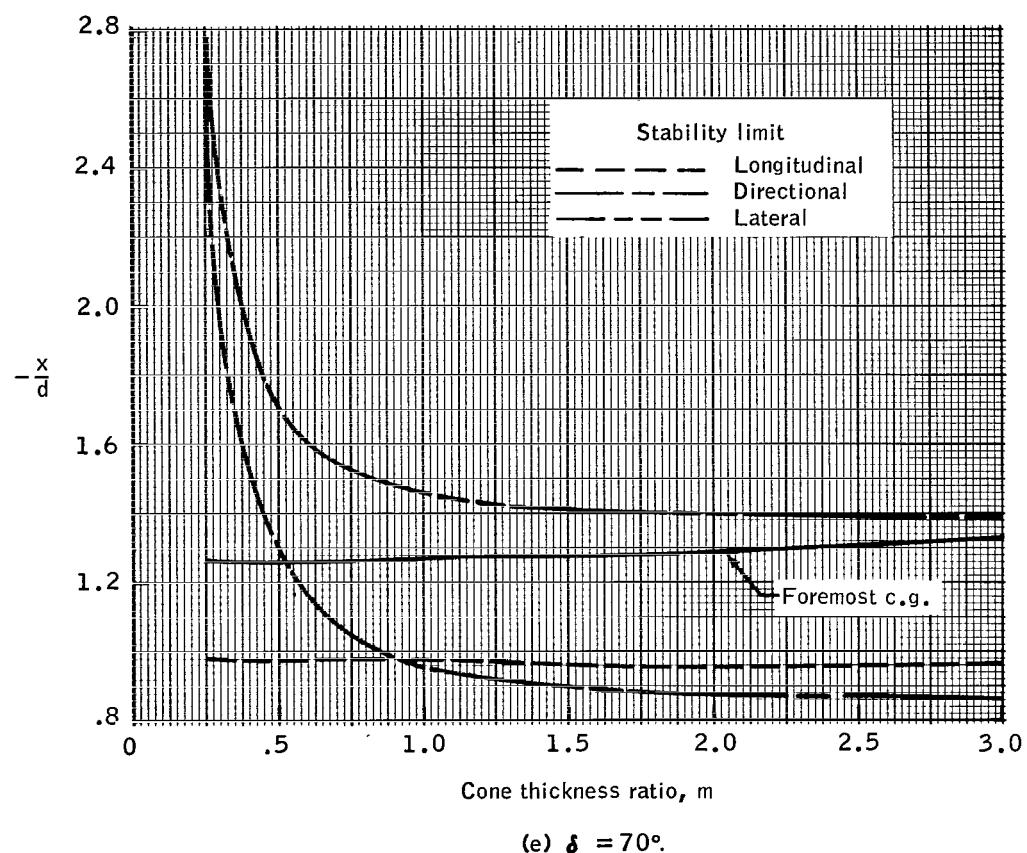
(f) $\delta = 80°$.
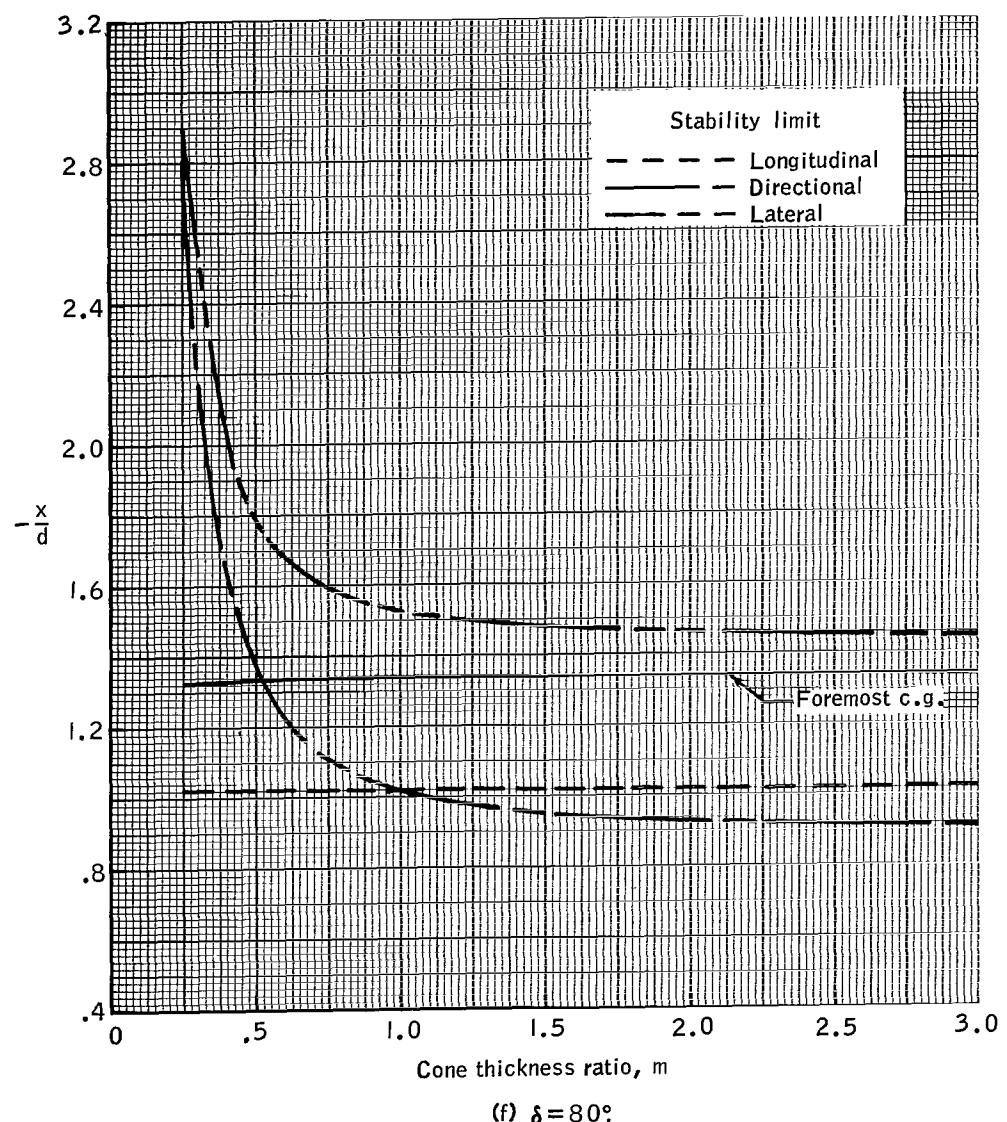
Figure 4. – Concluded.
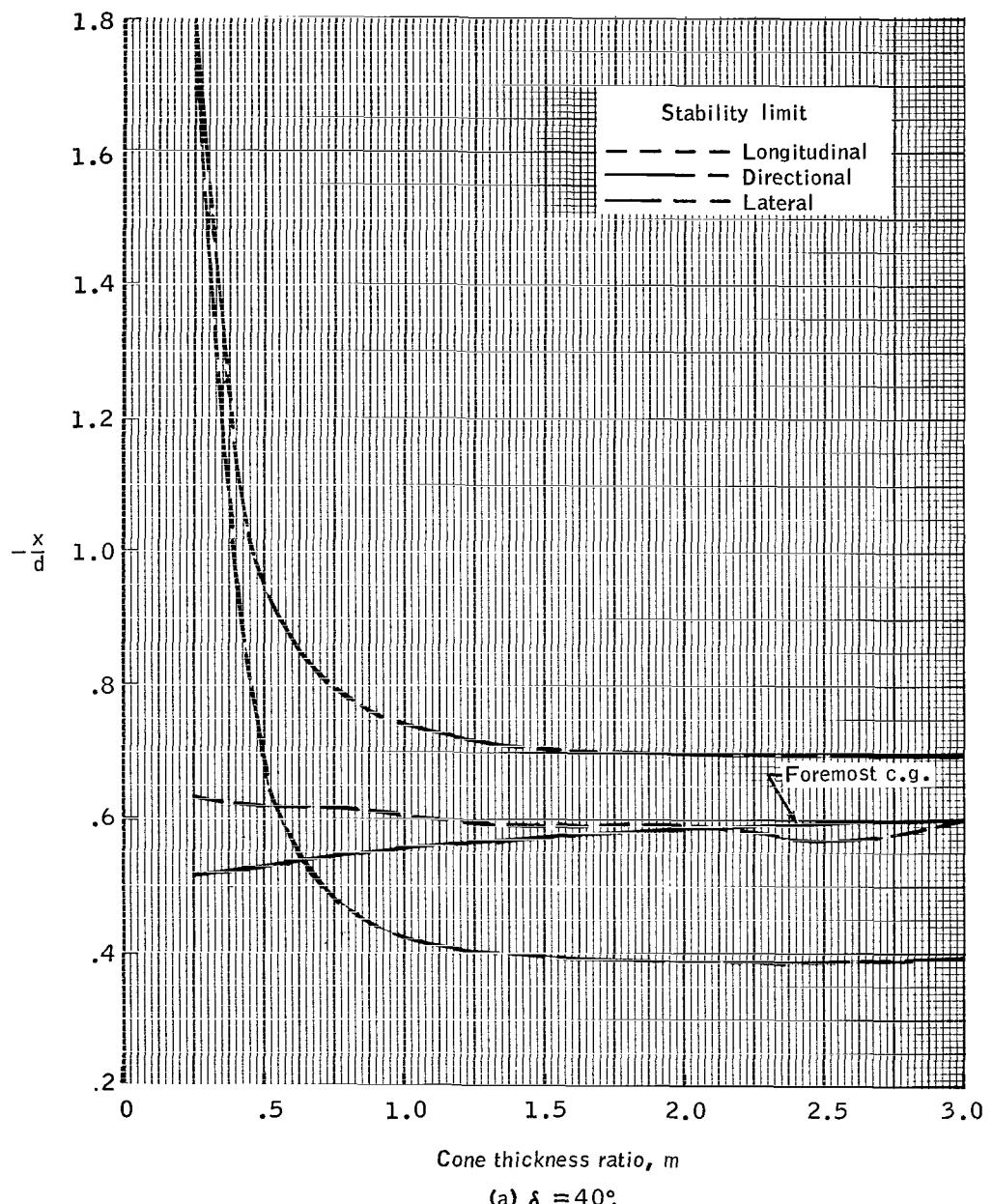
Figure 5. - Stability and foremost center-of-gravity limits plotted against cone thickness ratio, $\theta_{xz} = 30°$.

(a) $\delta = 40°$.
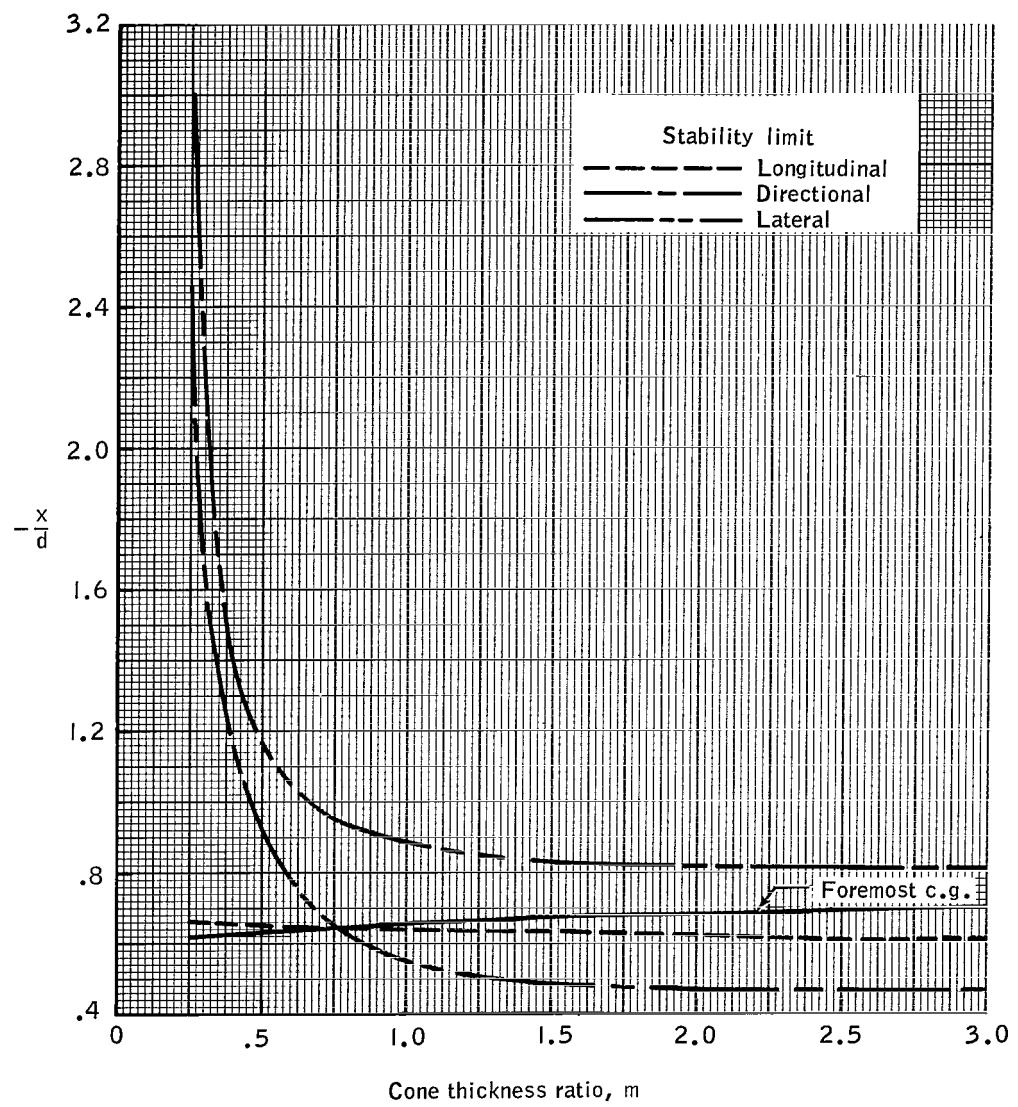
(b) $\delta = 50°$.

Figure 5.-Continued.
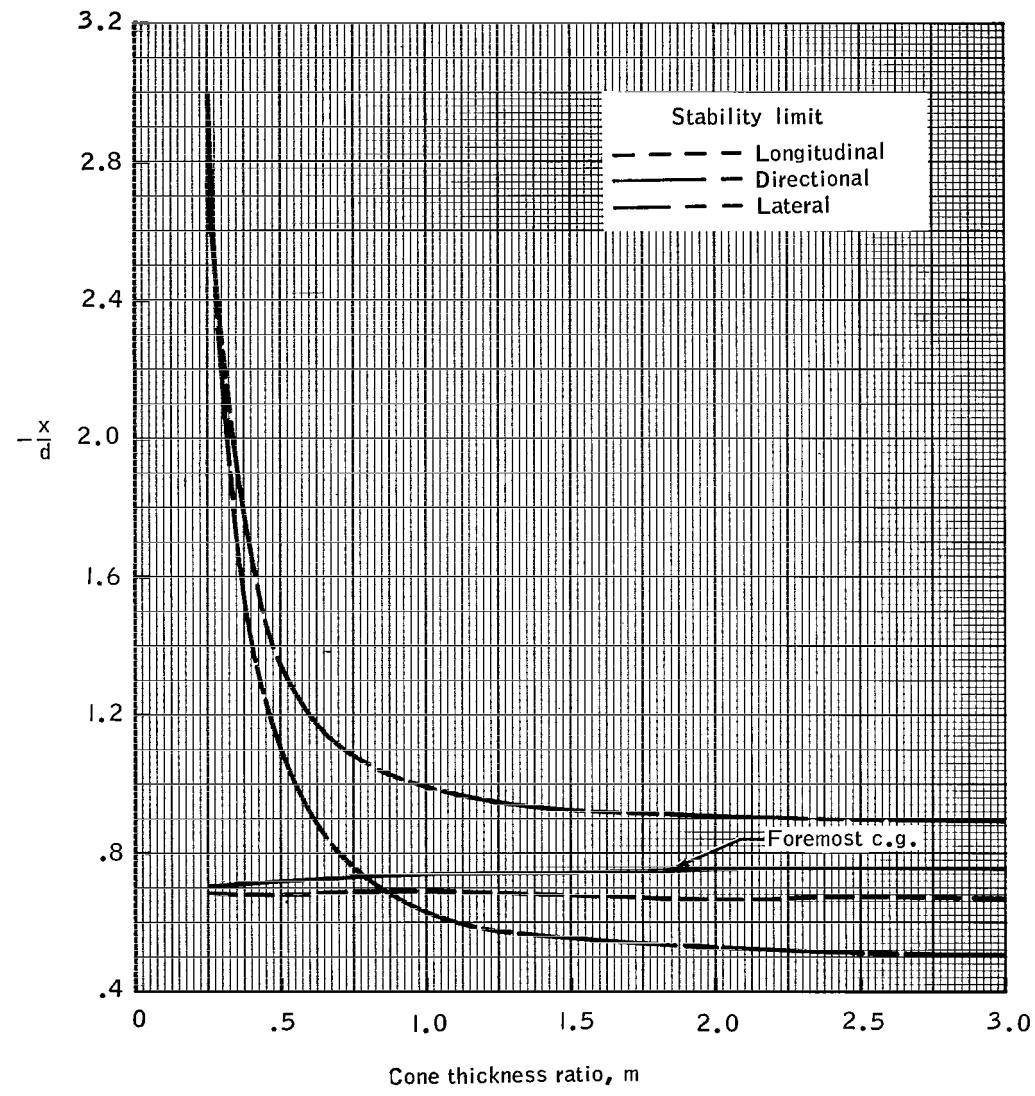
(c) $\delta = 60°$.

Figure 5. - Continued.

(d) $\delta = 70°$.

Figure 5. – Continued.

(e) $\delta = 80°$.
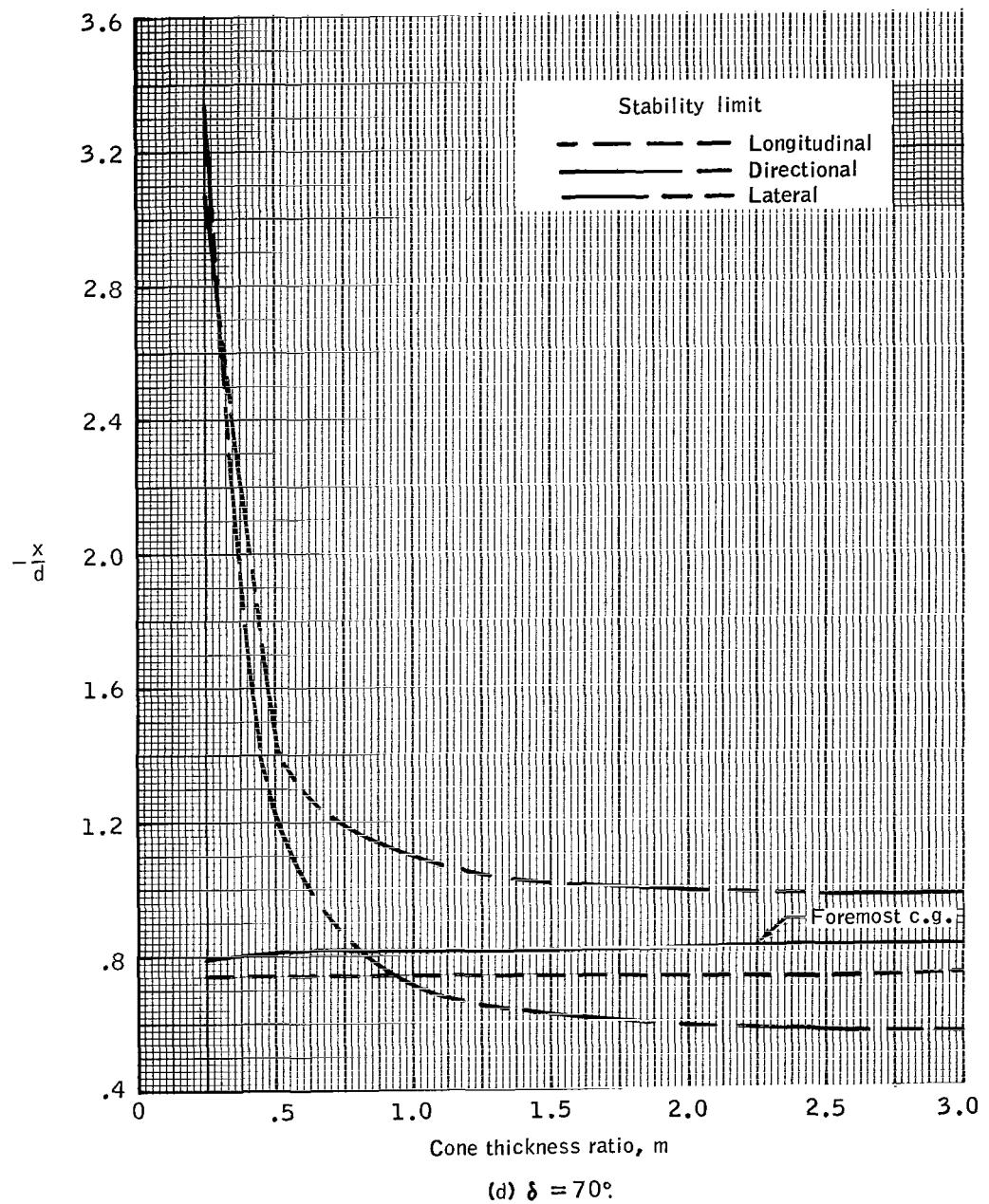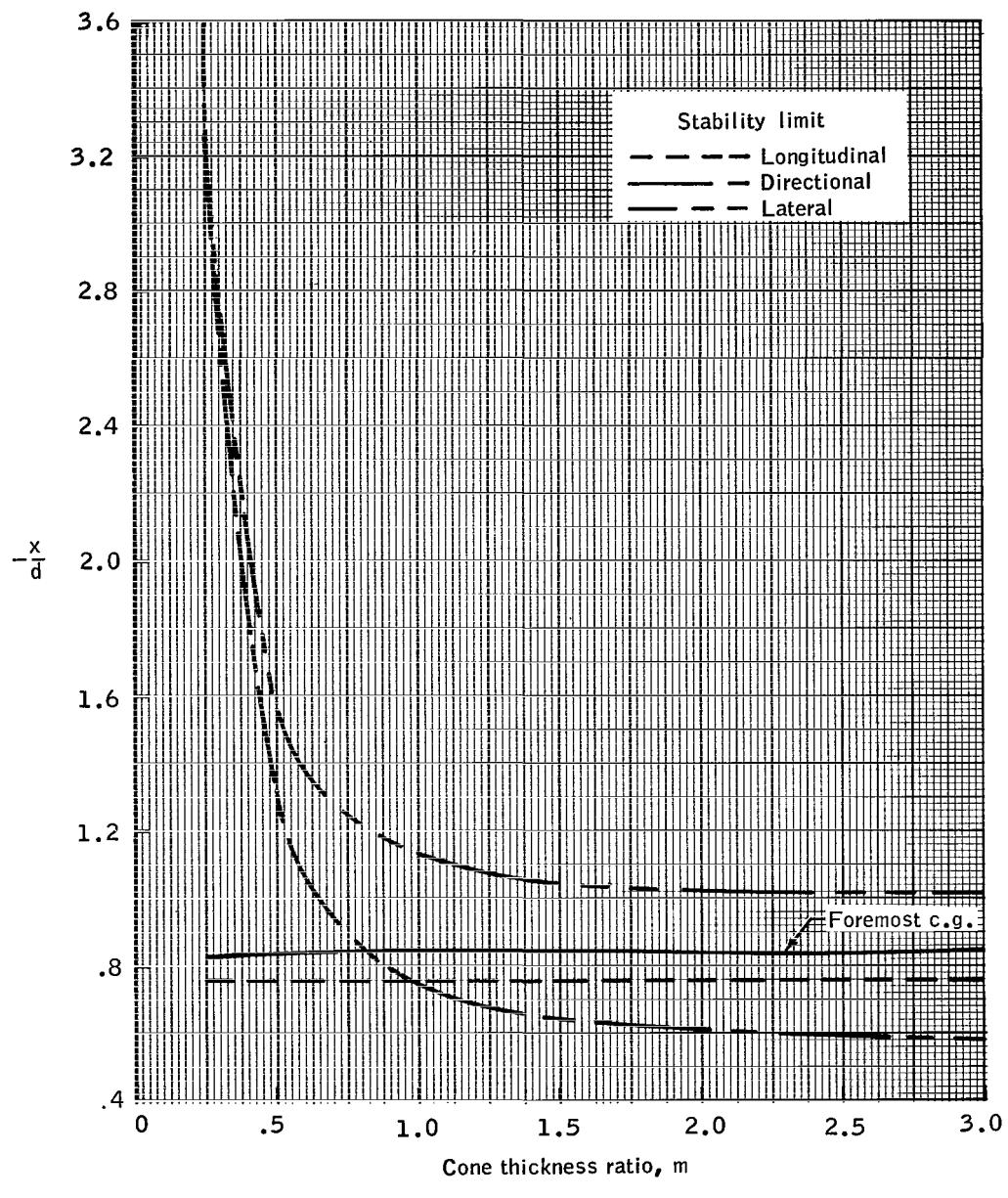
Figure 5. - Concluded.
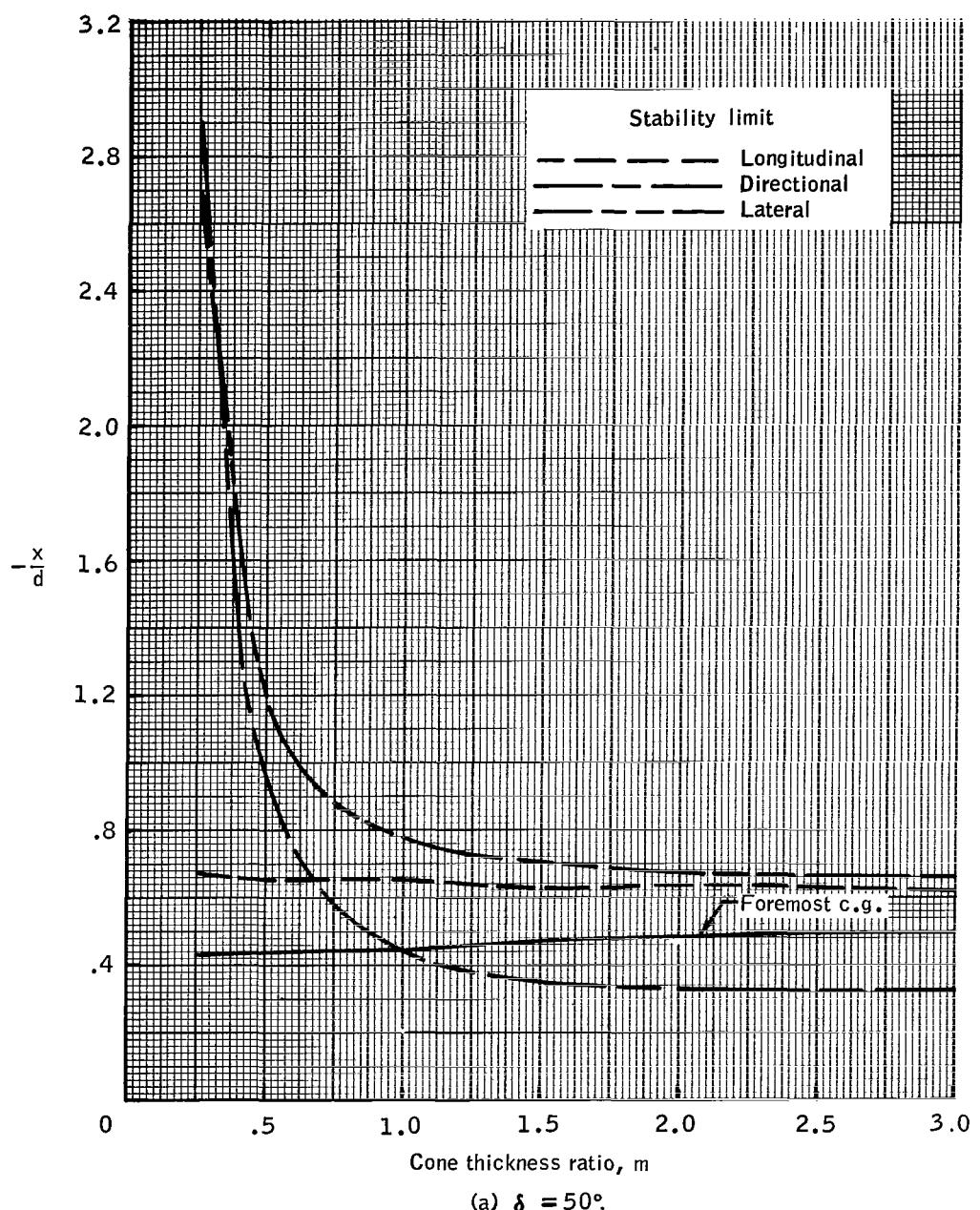
Figure 6. - Stability and foremost center-of-gravity limits plotted against cone thickness ratio. $\theta_{xz} = 40°$

(b) $\delta = 60°$.
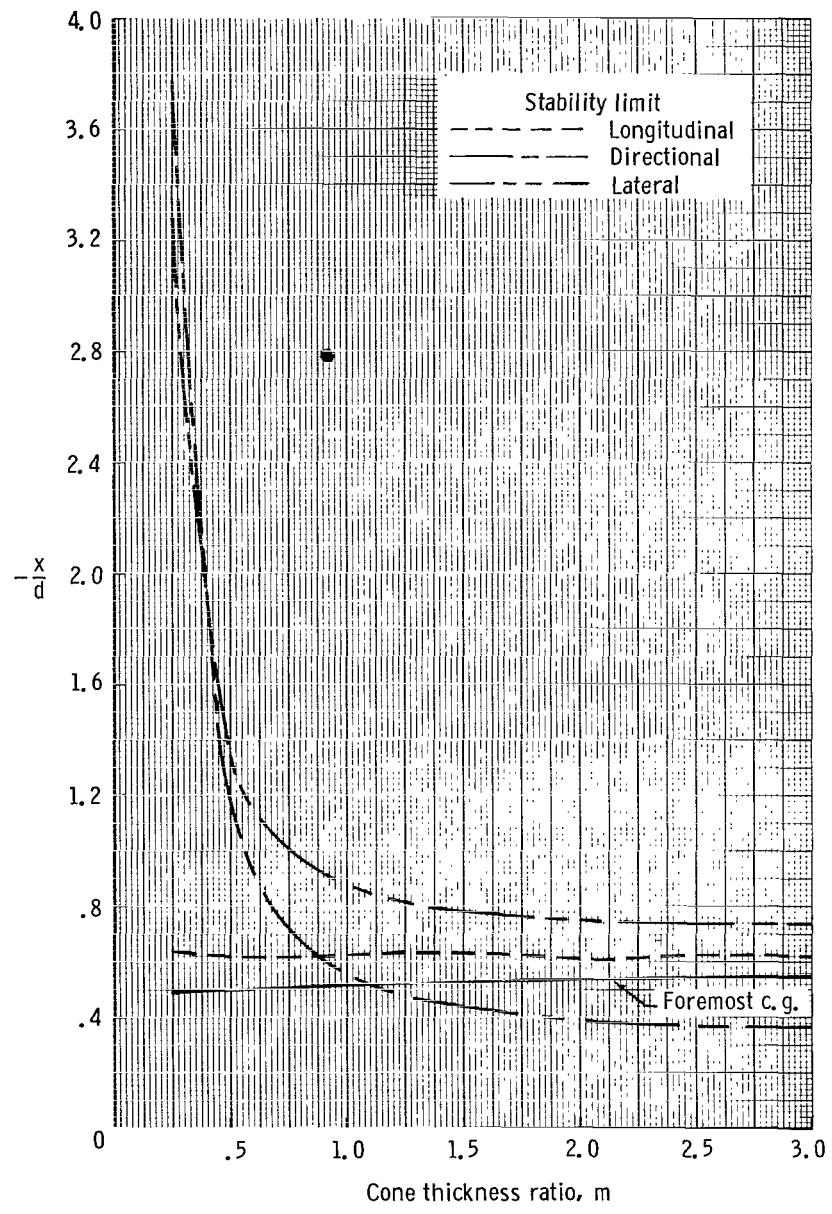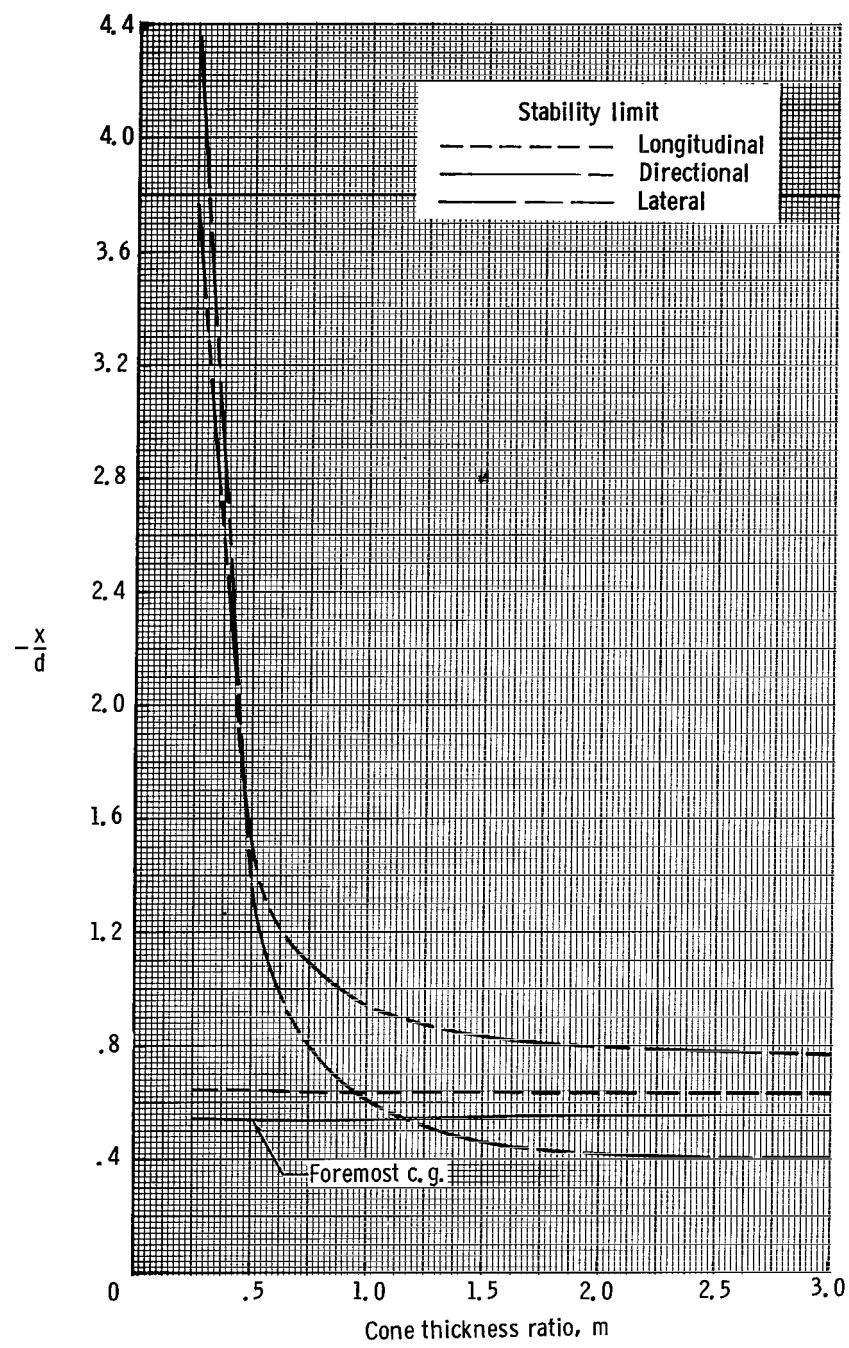
Figure 6. - Continued.

(c) $\delta = 70°$.

Figure 6. - Continued.

(d) $\delta = 80°$.
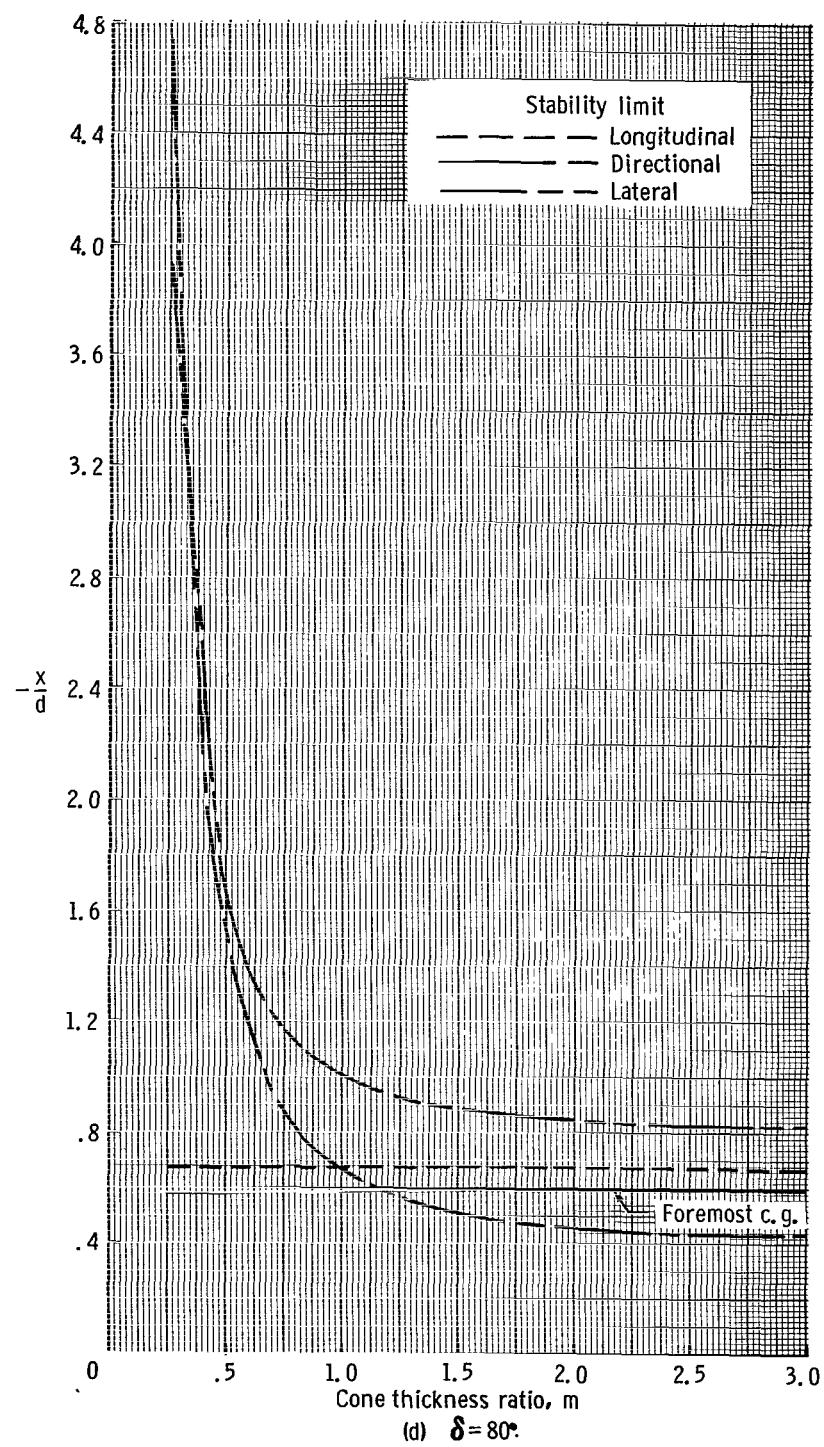
Figure 6. - Concluded.
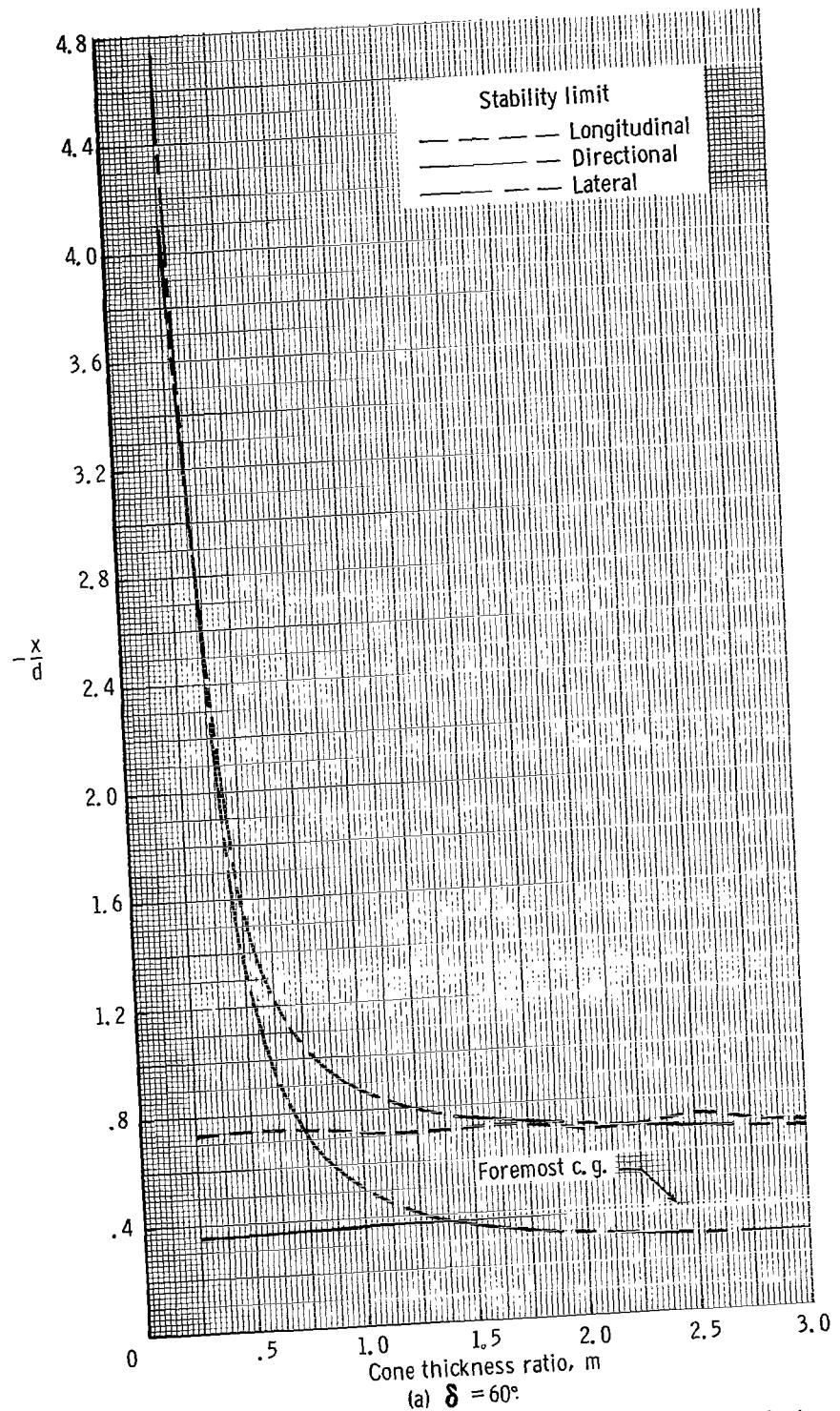
Figure 7. - Stability and foremost center-of-gravity limits plotted against cone thickness ratio. $\theta_{xz} = 50°$.

(a) $\delta = 60°$.

Stability limit

— — — — Longitudinal
———— — Directional
—— — — Lateral

$\frac{\bar{x}}{d}$

Foremost c.g.

Cone thickness ratio, m
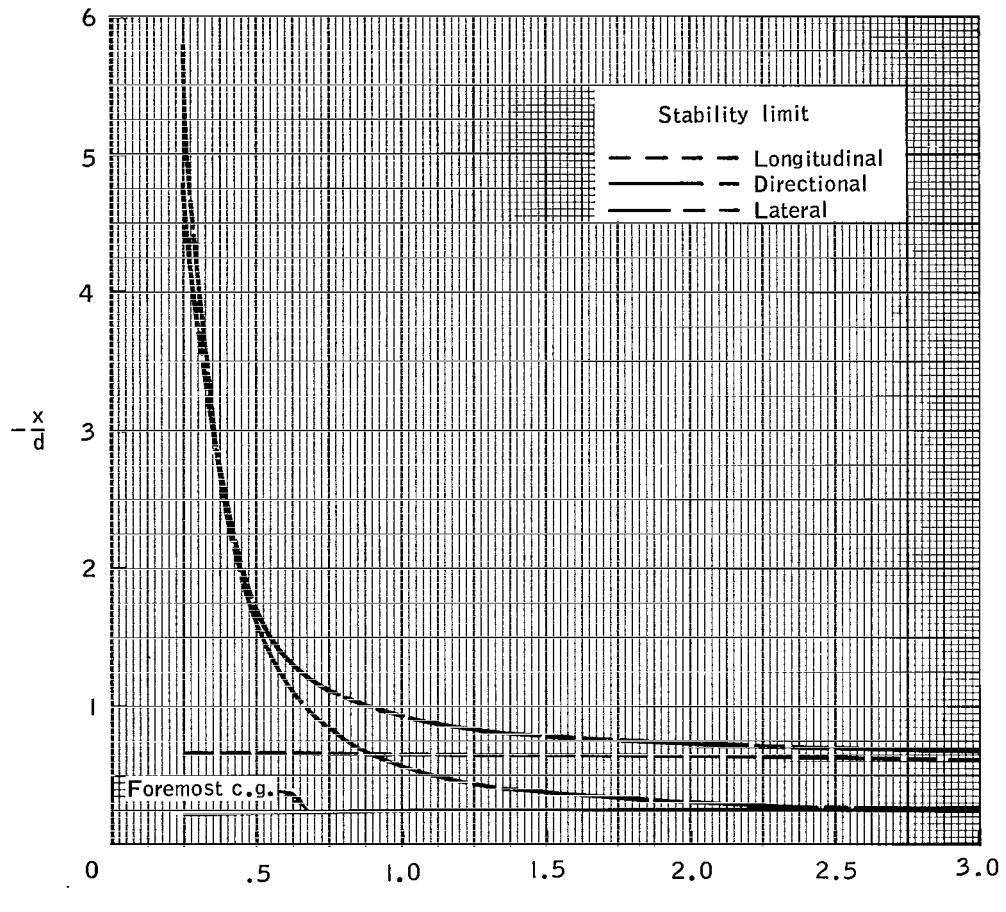
(b) $\delta = 70°$.

Figure 7. - Continued.
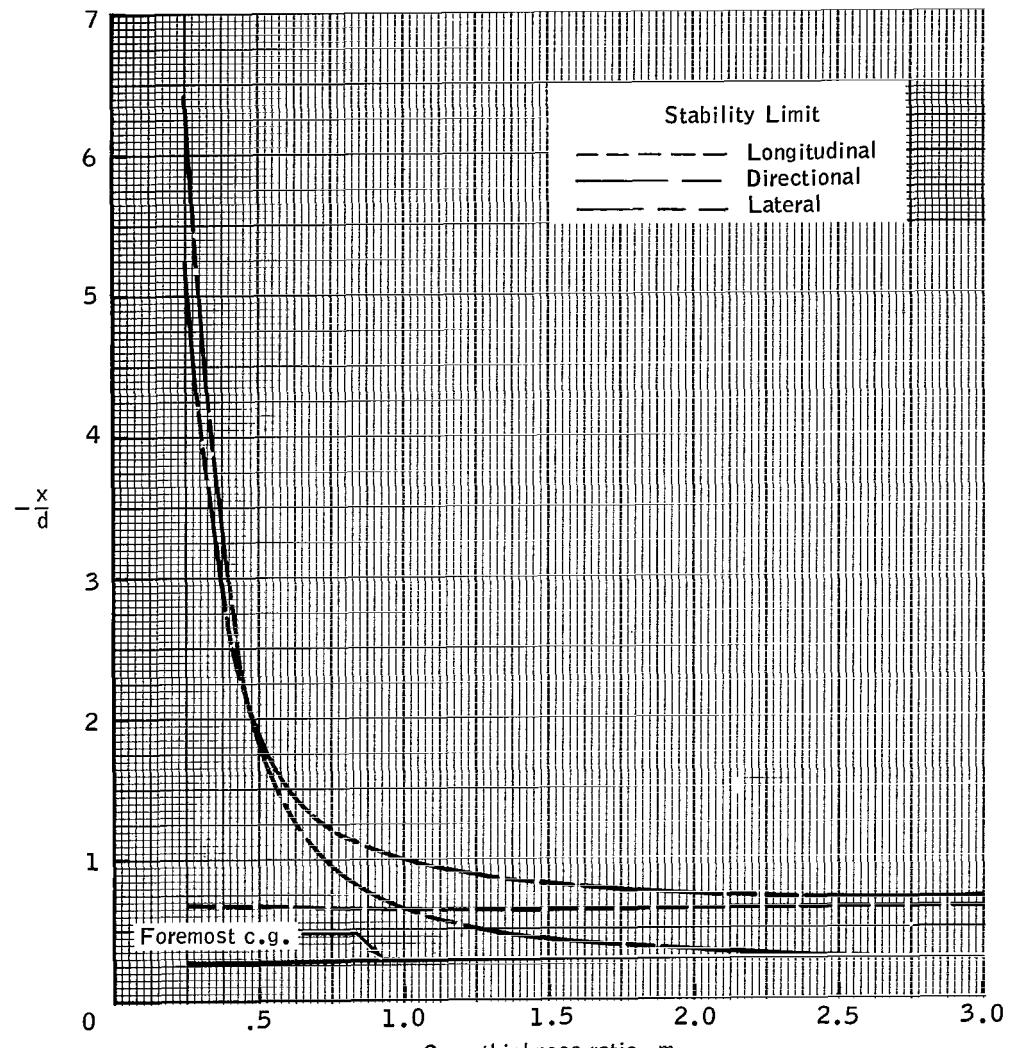
(c) $\delta = 80°$.

Figure 7. - Concluded.

(a) $\delta = 70°$.
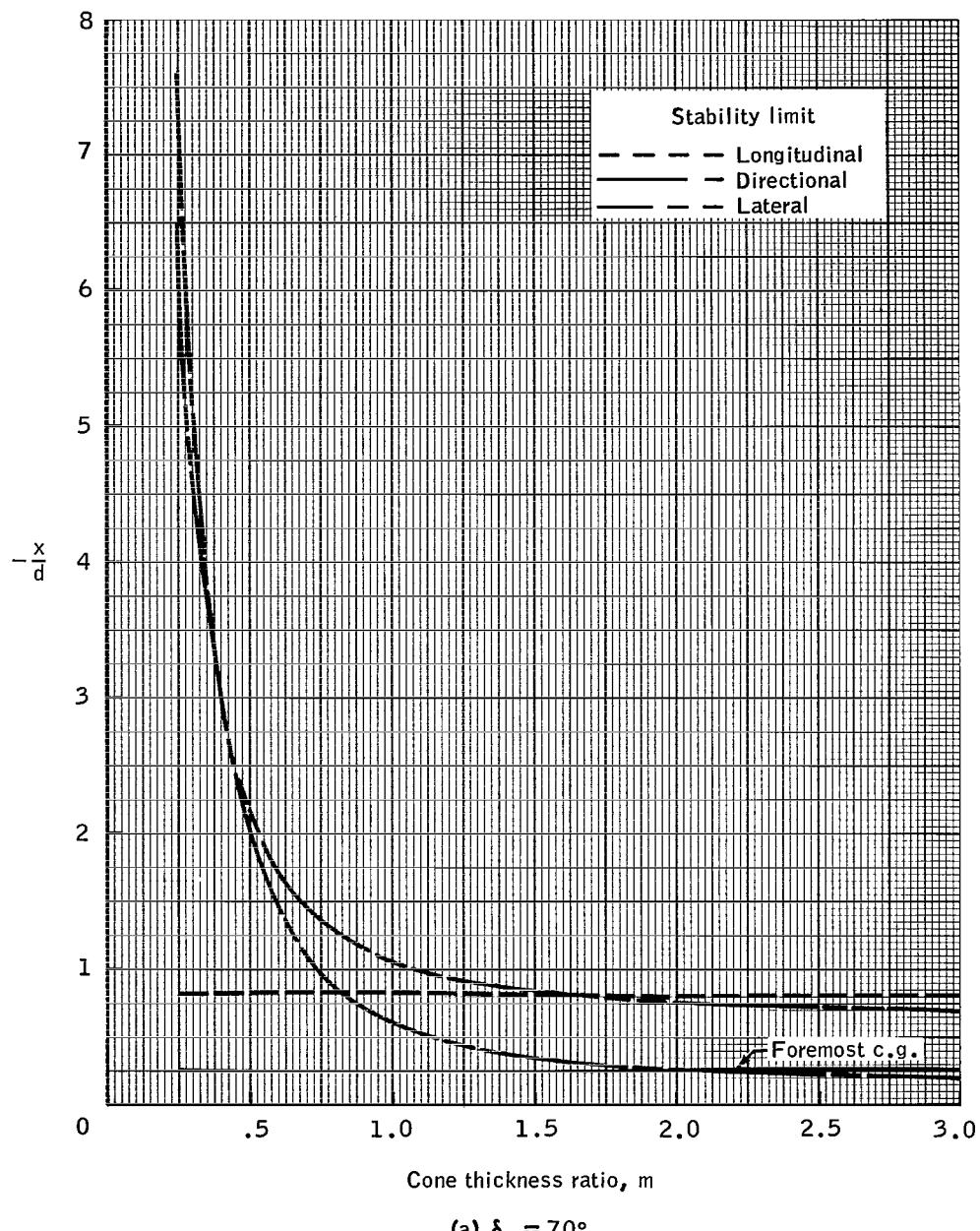
Figure 8. – Stability and foremost center-of-gravity limits plotted against cone thickness ratio. $\theta_{xz} = 60°$.

Stability limit
— — — — Longitudinal
———— — Directional
——— ﹘ ﹘ Lateral

Foremost c. g.

Cone thickness ratio, m

(b) $\delta = 80°$.
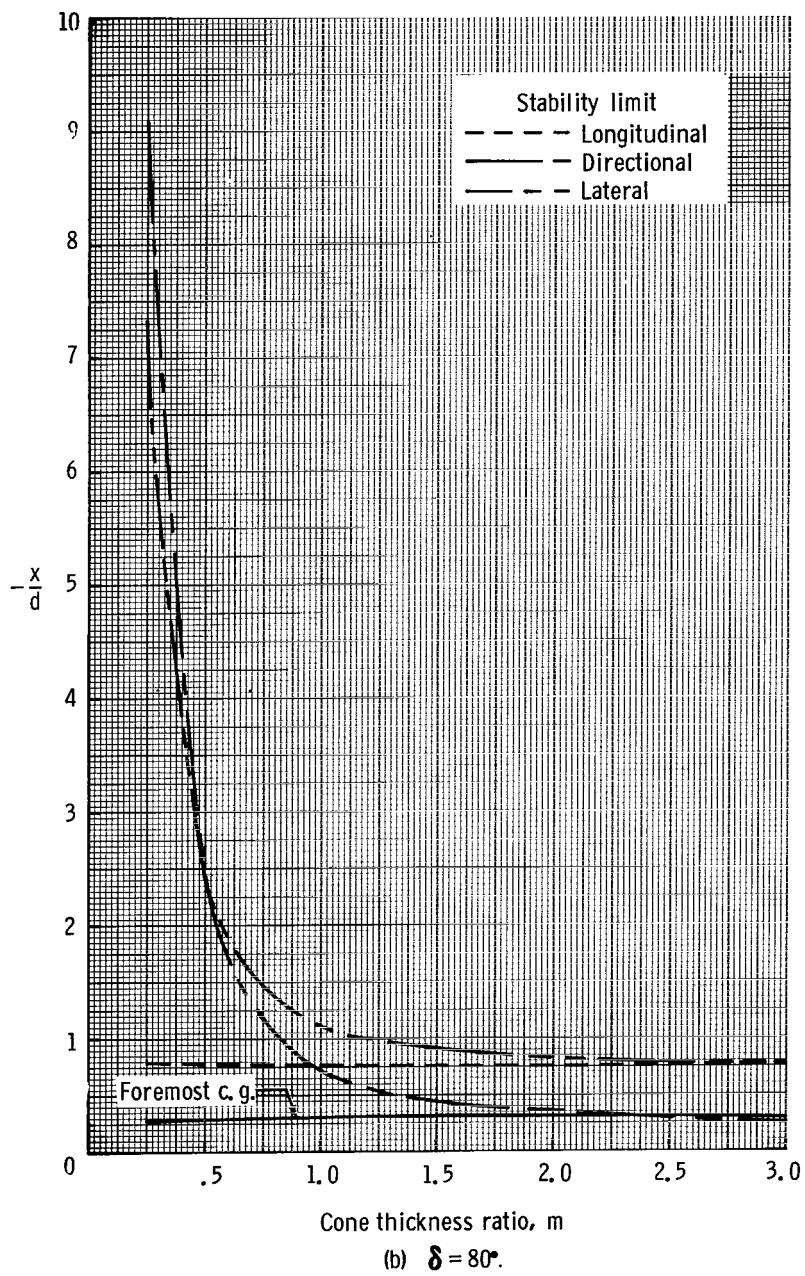
Figure 8. – Concluded.
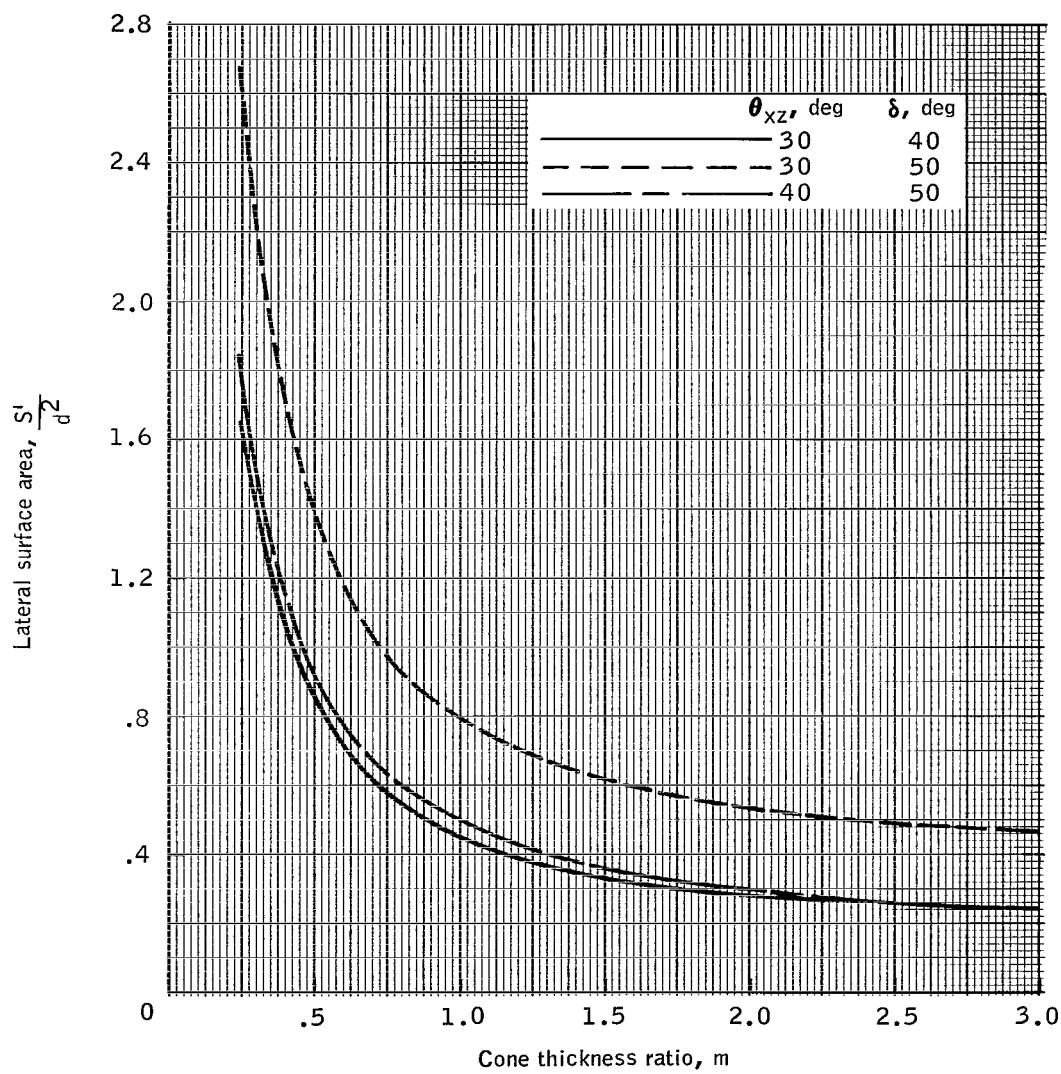
Figure 9. - Non-dimensional lateral surface area of raked-off elliptical cones plotted against cone thickness ratio.
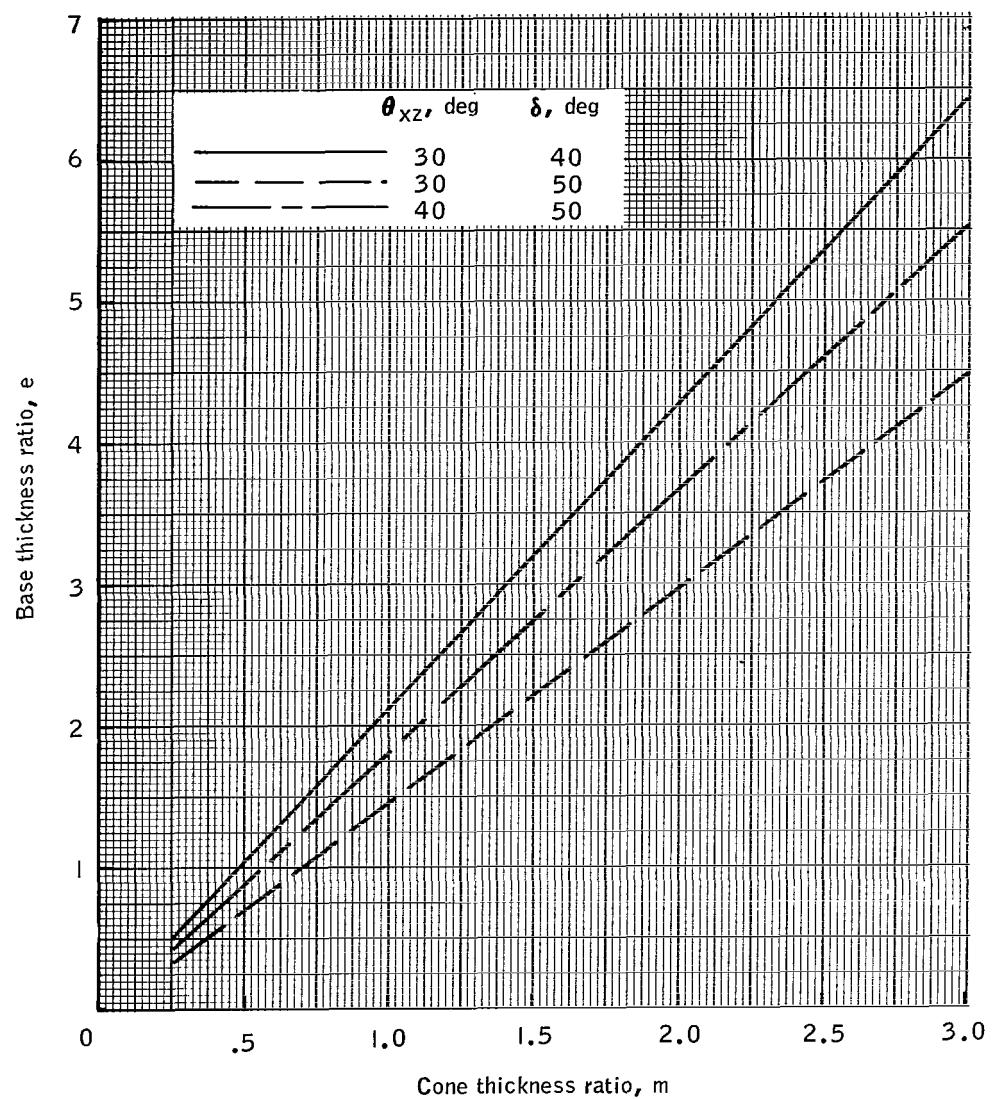
Figure 10. - Base thickness ratio plotted against cone thickness ratio.

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—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

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